STOPPING
WATER POLLUTION
AT ITS SOURCE

MISA
Municipal/Industrial Strategy for Abatement

THE DEVELOPMENT DOCUMENT
FOR THE
EFFLUENT MONITORING REGULATION
FOR THE
PULP AND PAPER SECTOR

Environment
Ontario

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Minister

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THE DEVELOPMENT DOCUMENT FOR THE EFFLUENT MONITORING REGULATION FOR THE PULP AND PAPER SECTOR

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PART 1

OVERVIEW OF THE PULP AND PAPER SECTOR

1. INTRODUCTION

There are twenty seven (27) pulp and paper mills located throughout the Province of Ontario which discharge waste effluent into surface watercourses. Of these twenty seven, sixteen mills are located in Northern Ontario, five in Eastern Ontario and the remaining six in South - Central Ontario.

Five mills discharge into northern watersheds. Two of these drain via the English and Winnipeg River systems into Lake Winnipeg. The other three drain into James Bay via large river systems.

One mill, located near Huntsville, discharges into a small river which drains into Vernon Lake.

The balance of the mills all discharge either directly or via river systems into the Great Lakes.

Historically, pulp and paper mills discharged solids and dissolved organic and inorganic materials into the receiving waters of the Province, in quantities that were frequently measurable in several tens of tons per day. Remedial programs to reduce these large discharges were developed by Ontario in the late 1960's. Since 1965, reductions in suspended solids of better than 90% and in 5-day biochemical oxygen demand (BOD5) of better than 60%, have been accomplished primarily through the mechanism of control orders. Notwithstanding these reductions, the rate of progress has been slow. Previous governments showed a reluctance to speed up the implementation of remedial programs for this industry for a variety of economical and political reasons. Also, the Industry was reluctant to install expensive pollution abatement systems in Ontario when such requirements were not being applied in other jurisdictions in North America.

Environmental concern no longer rests only with discharges of suspended solids and oxygen-demanding substances, but as a result of research by government, institutions and industry itself throughout the world, has expanded into acute toxicity, chronic toxicity, persistent toxic substances, mutagenic substances, bio-accumulation of toxic substances by fish and aquatic organisms and tainting of fish.

In many cases, the long-term effects of these discharges on the environment are not well known and understood. This uncertainty creates the need for a restrictive approach in the development of regulations as well as the need for more research into the long-term effects of these discharges on the environment.

2. HISTORICAL REVIEW

In the early 1960's, the Government of Ontario, through the Ontario Water Resources Commission, began investigating the quantity and quality of pulp and paper mill effluents being discharged into Ontario's waters. The results of these investigations were very enlightening and showed that the effluents at that time contained waste products which were measurable in tons per day. Of particular concern were the very large quantities of suspended solids and oxygen-demanding wastes which were being discharged into surface waters.

These findings resulted in the development of a pulp and paper abatement strategy which was formulated in the late 1960's. This strategy comprised a five year abatement plan which called for large reductions in the discharges of suspended solids within two years and large reductions in the discharges of oxygen-demanding wastes within five years. The strategy also outlined the in-plant control and waste treatment technologies that were available at that time to meet the requirements.

In the late 1960's, the Federal Government developed regulations under the Fisheries Act aimed at reducing the discharge of "deleterious substances" into both fresh and marine waters across the country. These regulations were promulgated in 1971. For "new and expanded mills," the regulations established allowable discharges of suspended solids and BOD5, and required that mill discharges pass a toxicity test. Guidelines were issued for existing mills which generally reflected the Ontario requirements. (ref: Federal Pulp and Paper Regulations)

Some success was achieved as a result of these two initiatives. By the mid-1970's, most Ontario mills had installed facilities for the removal of suspended solids which brought them into compliance with the Federal guidelines and/or requirements. At some locations, Ontario required additional suspended solids reduction based on identified local effects. These were achieved by industry and government through a program of "Control Orders."

In the case of oxygen-demanding substances, progress has been slower. For kraft mills, the Ontario program identified biological oxidation and in-plant control as the technologies necessary to achieve the reduction of oxygen demanding substances. Industry did not share the Ministry's enthusiasm for biological oxidation systems citing high capital and operating costs, concerns that biological systems would not necessarily guarantee compliance with discharge limit requirements and concerns about the performance of biological systems in the winter climate of Northern Ontario. The Industry also contended that in most cases, effects due to mill discharges were localized and rarely discernable at distances from the mills. Thus large capital expenditures for biological systems might only result in minimal benefits to the overall environment, according to the mills.

Three kraft mills have installed biological treatment systems in Ontario, at locations where the discharges were proven to have had pronounced effects on the receiving watercourse.

In addition, one paperboard mill which discharges to a small river, operates an aerated lagoon system and two mills which de-ink wastepaper, operate high rate biological oxidation systems.

Sulphite mills, which for the most part did not operate chemical recovery systems in the late 1960's when the requirements were initially formulated, discharged extremely large amounts of organic, oxygen-demanding substances. For these mills, chemical recovery or biological oxidation systems were identified as the technology alternatives available for the reduction of oxygen-demanding substances. In some cases, mills converted to other sulphite processes which could be operated economically with recovery but, in most cases according to Industry, installation of chemical recovery or biological oxidation would have been uneconomic.

Some sulphite pulping operations were shut down with production being replaced with thermal/mechanical or thermal/chemical/mechanical pulping processes in most cases. Other mills installed higher yield sulphite pulping processes or supplemented sulphite pulps with recycled or repulped fibre. These changes resulted in reductions in the amounts of oxygen-demanding wastes discharged by the mills.

Of the five mills currently employing sulphite pulping, two practice chemical recovery and the remaining three discharge untreated pulping liquors. The neutral sulphite semi-chemical pulping operation also discharges untreated spent pulping liquors.

Effluents from most mills which produce pulp from raw wood exhibit toxicity, regardless of the pulping processes used, unless they are treated. The degree of toxicity differs from mill to mill in Ontario and is a function of the pulping processes used, the wood species utilized, the amount of water used, the management practices for items such as spill control, and the nature of any external treatment.

Kraft mill effluents are of particular concern due to the presence of chlorinated organics, attributed to the use of chlorine and chlorine compounds in the bleaching operations. Certain chlorinated organics reportedly found in small quantities in kraft mill effluents, (chlorinated dioxins and furans) have been shown to be toxic, persistent in the environment and to accumulate in fish and aquatic animals.

Three Ontario kraft mills have installed biological oxidation systems, with one of the three also operating the only oxygen delignification system in Canada. At these mills, toxicity of the effluents has been reduced considerably and at the mill with oxygen delignification, the effluent is normally non-lethal. (Rainbow Trout LC50, toxicity test)

3. ENVIRONMENTAL CONCERNS OF PULP AND PAPER MILL EFFLUENTS

Over the years, numerous papers and reports have been written in Canada, the United States, Scandinavia and Europe which document both general and specific environmental concerns about all segments of the pulp and paper sector. A short reference list which is considered appropriate, is presented in Table 1.

Reference 1. in Table 1, a document which was prepared by the U.S. Environmental Protection Agency (EPA), is probably the most comprehensive document available and discusses the environmental concerns of the various sectors of the industry. The document was published in 1982 and was based on work completed in the mid to late 1970's.

Tables 2, 3, and 4 indicate specific chemicals that have been found or tentatively identified in pulp and paper mill effluents.

Table 2, "Parameters Of Concern Identified In Pulp and Paper Mill Effluents," is a list of compounds which was compiled by the Ministry from the literature referenced in Table 1. Each of these compounds is deemed to be of concern for the reasons shown.

Table 3, "Pre-Regulation Monitoring Open Characterization Data," lists those compounds which were tentatively identified as being present in trace quantities in effluents sampled by the Industry and the Ministry in a pre-regulation monitoring sampling program. The chemicals were tentatively identified by GC/MS library search routine. GC/MS, which stands for gas chromatography/ mass spectroscopy, is an analytical technique wherein chemical compounds are extracted from effluents by solvent extraction, separated by gas chromatography and then tentatively identified by computer comparison of their mass spectra with spectra in a "standard library." In some cases, tentative identification can be positive identification but in other cases, more detailed work would be required before a positive identification could be claimed.

Table 4, "Pre-Regulation Monitoring Data," lists those compounds from the Effluent Monitoring Priority Pollutant List (EMPPL) which were positively identified by Industry and the Ministry as being present in effluent samples collected under the pre-regulation monitoring program.

The range of chemicals is large. This should not be surprising if it is remembered that the basic starting material in this industry is "wood" which itself contains a wide variety of chemicals. Many of these chemicals are leached from the wood during pulping operations and new chemical substances are also formed during chemical pulping and bleaching operations.

Chemical groups generally acknowledged to be of environmental concern are resin and fatty acids (RFA's) (common to all wood species) and chlorinated organics which arise from the use of chlorine and chlorine compounds in pulp bleaching operations. Other chemical groups are also of concern and include sulphur compounds, phenolics and metals.

Environmental concerns about pulp and paper mill discharges are normally due to one or a combination of the following:-

* they contain large amounts of suspended solids which could be injurious to fish and aquatic life and which could settle out in the receiving waters, blanketing the bottom and rendering it inhospitable to normal populations of benthic fauna;

* they exert an excessive oxygen demand on the receiving waters, which could result in a depletion of dissolved oxygen concentrations;

* they show acute toxicity to fish and other aquatic animals when tested in a laboratory;

* they contain chemicals which are toxic to humans;

* they contain chemicals which have been shown to have or potentially have chronic (long term) toxic effects on fish and other aquatic life;

* they contain chemicals which are known to be persistent (or are chemically similar to known persistent chemicals and, therefore, potentially persistent) and which will not break down in the environment in the short term;

* they contain chemicals which are known to bio-accumulate in fish and other aquatic life;

* they contain chemicals which are known carcinogens or suspected of being carcinogenic due to their chemical similarity to known carcinogens;

* they contain chemicals which are known mutagens or suspected of being mutagenic; and

- they create problems of taste and odour in fish and drinking water supplies.

4. THE NEED FOR REGULATION

At present, Ontario pulp and paper mills monitor their effluents, at their own costs, under the Ministry of the Environment's Industrial Monitoring Information System (IMIS) requirements or under requirements imposed by the Ministry in Control Orders.

The data reported to the Ministry under these programs include:-

- BOD5
- pH
- nitrogen
- phenols
- toxicity testing
- suspended solids
- specific conductance
- total phosphorus
- some metals

Monthly average IMIS data is published for each mill by the Ministry in the annual report, "Report on the Industrial Discharges in Ontario."

Currently, the Ministry of the Environment utilizes "Control Orders" issued under the Ontario Water Resources Act or The Environmental Protection Act, to impose abatement requirements on industry. The new MISA initiative, which was announced in 1986, has as its goal the virtual elimination of the discharge of persistent toxic substances into the waters of Ontario from municipalities and industry. This goal will be accomplished by the development of regulations which will impose limits on the amounts of individual toxic substances (or groups of substances) as well as the so-called conventional parameters that may be discharged in an individual plant effluent. These limits will be based on the application of "Best Available Technology, Economically Achievable (BATEA)."

As a first step in the development of limits regulations for the pulp and paper sector it is necessary to ascertain precisely what toxic chemicals are contained in the mill discharges. This will be accomplished by monitoring each separate discharge under stringent conditions required for measuring flow, collecting samples, storing samples and finally, analyzing the samples. Using historical data, information from the literature and information gained from a pre-regulation monitoring program, a list of substances has been developed which is applicable to the sector and which will form the basis for the analytical requirements.

MISA policy requires that industry will perform the monitoring at its own cost. The Monitoring Regulation for the Pulp and Paper Sector will ensure that the monitoring of individual discharges is carried out under the required conditions and for the required parameters. This regulation will carry with it penalties for non-compliance as prescribed under the Environmental Protection Act.

PART 11

TECHNICAL RATIONALE
FOR THE
MONITORING REQUIREMENTS

1. INTRODUCTION

The purpose of the technical rationale section is to explain the steps in the development of the Pulp And Paper Effluent Monitoring Regulation.

The section provides background information on the options considered in arriving at the specific monitoring approach to be used for mills in this sector. It also provides background information on the rationale used to select the parameters to be monitored and the frequency at which they shall be monitored.

2. THE APPROACH TO REGULATION DEVELOPMENT

The MISA program for regulation development is based on a joint consultative approach with Industry and the Federal Government.

A Joint Technical Committee (JTC), comprising technical representatives from the Ministry, Industry and the Federal Department of the Environment was established late in 1986. This committee held its first meeting in November, 1986 at which time the general membership was ratified. Also, a member of the MISA Advisory Committee was invited to participate in the JTC meetings.

The JTC served as a vehicle for resolving problem areas and for reaching consensus on the content of a draft regulation. To assist the JTC, a number of working groups or sub-committees were established. These groups advised the JTC on highly specific technical areas or performed specific functions for the committee. Of particular note were the following:-

1. The Analytical Working Group - primarily used to develop new analytical protocols and resolve problems related to chemical analysis.

2. The Flow Measurement Sub-Committee - charged with making recommendations on the flow measurement and sampling requirements to be included in the monitoring regulation. A consultant was hired at the recommendation of the JTC to assist the sub-committee in gathering the data necessary to complete the task.

3. The Storm Water Sub-Committee - charged with assisting a consultant to conduct a study of all point source storm water discharges throughout the sector and to review the consultant's report prior to submission to the JTC.

4. The Regulation Writing Sub-Committee - charged with preparing the text of a draft sector regulation and with developing the rationale for monitoring requirements, including the frequency of sampling and the analytical requirements for the various types of effluent discharges.

The JTC held 13 meetings during the course of the regulation development. Consensus was often difficult to reach on items where a fundamental difference of opinion existed between the Industry and the Ministry. In some cases, the Ministry found it necessary to insist on a certain course of action particularly where any deviation would conflict with Ministry policies.

To assist with the development of the regulation the Industry, under the auspices of the Ontario Forest Industries Association, undertook a comprehensive study of the composition of mill effluents being discharged directly to surface waters throughout Ontario. The study was designed to generate a database of mill effluent quality and cost in the order of $1 million.

The results of this study were submitted to the Ministry in a document entitled, "Ontario Pulp and Paper Mills - Effluent Composition - May 1988."

3. MILL CLASSIFICATION

The mills in Ontario manufacture a wide range of products with newsprint being predominant and accounting for over half the production. Other products include, bleached kraft market pulps, groundwood specialty papers, fine papers, linerboard, corrugating medium, paperboard and tissue products.

A wide variety of pulping and paper-making processes are employed in the manufacture of these products. Nineteen of the mills manufacture pulp directly from logs or wood chips, either for use directly in the manufacture of other products or for sale in world markets. The other eight mills either purchase pulp or use waste paper products as a source of raw materials for their manufacturing processes.

Appendix 1, "Summary Data of Ontario Mills," contains basic data on each of the 27 operating mills in the Province of Ontario.

Nine mills operate the "kraft" pulping process. Eight of these mills use combinations of chlorine, chlorine dioxide and hypochlorite to produce a range of bleached kraft pulps which are either used internally in the manufacture of finished paper products or sold externally. The other kraft mill manufactures linerboard as its predominant product but also uses chlorine bleaching to produce semi-bleached kraft pulp which is used in the manufacture of newsprint.

Products from these nine kraft mills include bleached kraft market pulps, fine papers, newsprint and specialty groundwood paper products. Two of the kraft mills which manufacture newsprint and specialty groundwood papers, also produce pulp by mechanical pulping and one of the two operates a sulphite pulping process.

Five mills operate "sulphite" pulping processes to produce pulps which are used in the manufacture of newsprint. Each of these mills produces mechanical pulps which constitute the major component of newsprint. One of the mills, as mentioned above, is integrated with a kraft mill complex.

Four mills operate mechanical or chemical/mechanical pulping processes to produce pulps which are used in the manufacture of newsprint, specialty groundwood products or fine papers. Pulps to supplement the mechanical pulps are normally purchased except at one mill which recycles waste paper. This mill manufactures supplementary pulp by a deinking process.

Two mills manufacture corrugating medium by chemical pulping processes. One mill employs the "neutral sulphite, semi-chemical" (NSSC) process while the other uses a sodium carbonate process.

Three mills manufacture a wide range of fine papers using purchased pulps. One of these mills produces supplementary pulp by deinking recycled waste paper. These mills do not operate any wood pulping processes.

Three mills produce a range of paperboard and cardboard products from recycled waste paper and waste cardboard. Since the products do not require a high degree of whiteness, deinking is not necessary. These mills do not operate any wood pulping processes.

Lastly, two mills manufacture a range of tissue and crepe paper products from purchased pulps. These are fairly simple operations and do not involve any wood pulping.

With this diverse range of manufacturing processes and products, it is not difficult to understand that no two mills are alike. This fact is a complicating factor when the development of regulations is being considered for this industry.

In reviewing the operations at individual mills and having knowledge of the chemicals that are likely to be of concern at each mill, the Ministry determined that it would be possible to classify mills into a limited number of groups. This would simplify the regulation and make it more manageable.

For example, not all of the effluents from the nine kraft mill exhibited the presence of the same chemicals in the pre-regulation monitoring program. It is reasonable to assume, however, that the same chemicals could be potentially present at all nine mills even acknowledging that there are differences in process operations, wood species, chemical consumption, etc.

Also, sulphite pulping operations in Ontario, although exhibiting a wide range of chemicals in their effluents, do not use chlorine or chlorine dioxide for bleaching and are normally associated with mechanical pulping operations. The chemicals of concern are similar for both sulphite and mechanical pulping operations and for these reasons the two can be classified together.

The effluents from corrugating-medium pulping operations exhibit concerns similar to those of sulphite mill effluents but the mills are placed in a separate category due to the different nature of their product.

A similar rationale holds for those mills which do not produce pulp from raw wood (deinking, board, fine papers, and tissue) and they are classified together.

Finally, it was noted that certain basic analytical requirements are applicable to all mills regardless of category.

The categories of mills used in the regulation are:-

- KRAFT
- SULPHITE-MECHANICAL
- CORRUGATING
- DEINKING-BOARD-FINE PAPERS-TISSUE

Section 3.1 of the monitoring regulation sets out the mills in each of the categories.

4. PRE-REGULATION MONITORING

As part of the regulation development process, the pulp and paper industry of Ontario, under the auspices of the Ontario Forest Industries Association (OFIA), voluntarily undertook a comprehensive study of the compositions of mill effluents being discharged directly to surface waters in the province. This study is known as the "pre-regulation monitoring program." The purpose of this program was to characterize the wastes from each mill in the province and thereby establish a data base which could be used in the development of a monitoring regulation. The Ministry was supportive of the program and agreed that the data would be used, along with data from other sources, to assist with the development of a regulation.

Industry undertook the sampling and analysis of each mill's effluent four times during 1987. Samples of intake water and final effluent discharge were collected at each mill and analyzed for a broad range of priority and conventional pollutants. In addition, rainbow trout fish bioassays were performed on all effluent samples.

In developing a list of parameters for monitoring, it is important to select only parameters for which widely accepted standard analytical protocols are available. EMPPL and its associated analytical protocols were not available when the pre-regulation monitoring commenced and for this reason, Industry elected to use the EPA's priority pollutants list. The complete list of parameters targeted in the study is shown in Table 5.

Five parameters on the EPA list were omitted. Asbestos was omitted because of the unlikelihood of finding the material in pulp and paper mill effluents. The chlorinated dioxin, 2,3,7,8-tetrachlorodibenzo-p-dioxin was omitted due to lack of an applicable analytical capability at commercial laboratories for levels likely to be found in pulp and paper mill effluents. Acrolein, acrylonitrile and N-nitrosodimethylamine were omitted as they were not amenable to analysis by available standard analytical procedures routinely used by commercial laboratories. Xylene and mesitylene were included since analytical methods were available. Finally, aluminum was added to the list since aluminum compounds are frequently used in pulp and paper mill operations.

GC/MS " forensic scans," (organic open characterization) consisting of library searches of the volatile, acid and base-neutral extracts from samples collected in rounds 1 and 4 were also carried out.

Later in the year, the Ministry also undertook to sample and analyze effluents from each mill once during the course of the pre-regulation monitoring program. The Ministry's target list of parameters contained the compounds from the EMPPL for which analytical protocols were available. This meant that the list was essentially the same as that of the industry. In addition, the Ministry performed one GC/MS "organic open characterization " on most mill effluents.

Analysis for chlorinated dioxins and dibenzofurans was not carried out by the Ministry due to problems which had been experienced with the analyses for these substances in pulp and paper mill effluents.

In cases where there was more than one effluent discharge point at a mill, Industry elected to combine samples in order to reduce costs. This meant that where a mill had more than one effluent discharge or where two or more contributory streams were normally used to monitor a single effluent, samples from each individual discharge or contributory stream were not separately analyzed but were combined prior to analysis.

19 mills had single effluent discharges and combined samples were used on the remaining 8.

In combining samples, there is a risk that compounds present at levels close to detection limits may be diluted beyond the method level of detection and that chemical reactions could occur in mixing the samples which could yield misleading data.

Notwithstanding these concerns, Industry argued that the data generated by the program adequately characterized the discharges from each mill.

Although the Ministry does not support the use of combined samples, it did agree that the pre-regulation monitoring data had merit and would be used, along with other information, in the development of the regulation.

Table 5 is a list of the analytical target parameters covered by the Industry in its pre-regulation monitoring program.

Table 6 indicates the parameters retained and rejected following initial screening of the pre-regulation monitoring data by Industry. The parameters eliminated were those which were not found in any mill effluents during the four rounds of sampling or those which were eliminated by the Industry's initial screening techniques. The two main validation criteria applied by Industry were that average of the reported concentrations from the four rounds of sampling had to be greater than the method detection limit and the values reported for effluent samples had to be at least twice those reported for the intake water.

Table 4 lists those compounds from EMPPL which were positively identified from industry and ministry samples as being present in effluent samples. Maximum, minimum and arithmetic mean values as reported by the OFIA pre-regulation monitoring study, are included.

Table 3 lists those compounds which were tentatively identified by GC/MS "forensic scan" or "organic open characterization," as being present in the samples analyzed by the Industry and the Ministry. Most of these compounds are not on EMPPL and may not have been screened through the EMPPL process to determine whether they are of concern.

5. ANALYSIS OF PRE-REGULATION MONITORING DATA

Table 4, lists by mill category, the EMPPL compounds found at each mill in the pre-regulation monitoring program. As can be readily seen, not many EMPPL compounds were found and only a few were found to be common to all mills or to a mill category. Table 4 is based on data generated from the Industry's pre-regulation monitoring sampling program after initial screening and the Ministry's pre-regulation monitoring sampling program. During the initial screening, all parameters which were reported as non-detectable in mill effluents during all four rounds of sampling were removed from the parameter list. In addition, the nineteen chlorinated pesticides were removed during this screening phase for reasons discussed below. Table 6 lists the parameters from the Industry's pre-regulation monitoring data which were eliminated during initial screening and those which remained following the initial screening.

METALS:

A review of Table 4 indicates that a number of metals were detected above the method detection limit. Of these, aluminum, cadmium, copper, chromium, lead and zinc were detected at most mills.

Aluminum was found in all mill effluents, often in the low parts per million (ppm) range. Alum and other aluminum salts are used in paper making processes as conditioners and this use probably accounts for the presence of aluminum in mill effluents. Aluminum is known to be toxic at higher concentrations, and in natural waters concentrations in excess of 0.1 ppm are known to be deleterious to the growth and survival of fish. For these reasons, the Regulation Writing Sub-Committee agreed that aluminum warranted high-frequency monitoring.

Cadmium, **copper**, and **chromium** were found in most mill effluents in low concentrations. The sources of these elements are not clearly understood since products containing these elements are not used in mill processes. Although these three elements are known to be present in wood, their concentrations in wood would not be expected to give rise to the levels found in the mill effluents. Their presence is probably more attributable to normal corrosion and erosion of equipment used in the mills. As such, the concentrations of these metals in the effluents would not be expected to vary significantly.

The Ministry's position with respect to these elements was that at the concentrations found, they should be candidates for high-frequency monitoring. Industry on the other hand, maintained that although the data indicated a need for further investigation, high frequency monitoring was not warranted. It was finally agreed that monthly monitoring for these elements would suffice to determine whether they were potentially problematical, thereby, warranting further investigation under the limits regulation.

Lead was found at all mills in very low concentrations except at one mill where the maximum level detected was 18 parts per billion (ppb). Again, the source of the lead is not clearly understood since lead and lead compounds are not used in pulp and paper operations. It can be postulated that the lead originates from its presence in trees and to a lesser extent, from corrosion or erosion of equipment in the mill (eg. lead-based solder).

Since the levels in the pre-regulation monitoring data were low and since the levels would not be expected to vary significantly, it was agreed that monthly monitoring for lead would be adequate to determine whether lead was a problem element warranting further investigation under the limits regulation.

Zinc was found in all mill effluents in concentrations as high as 840 ppb although at most mills the level was below 200 ppb. The source of these relatively high concentrations is not accurately known although there is some evidence to suggest that the zinc originates in the wood used for pulping. No Ontario mills use zinc compounds for pulp brightening although it is possible that zinc compounds may be used in processing.

Since the levels of zinc found in the pre-regulation monitoring program were relatively high compared to the Provincial Water Quality Objective (PWQO) of 30 ppb, it was agreed that zinc was a potential candidate for control and warranted high frequency monitoring.

Other metals were detected at individual mills but concentrations were generally low with the exception of two mills which showed moderately high levels of thallium. The occurrence of these metals in the effluents is probably attributable to the presence of the metals in the raw wood used for pulping. (It is interesting to note that the two mills showing higher levels of thallium are located in Northwestern Ontario.)

These other metals detected in the pre-regulation monitoring program were not considered to be of significance and the Regulation Writing Sub-Committee agreed that high-frequency monitoring was not justified. It was agreed that further monitoring of these metals should be conducted as part of the sector characterization requirements.

Mercury, ATG 12, was found in very low concentrations at a number of mills. In general, the levels were below the PWQO of 0.2 ppb with a few results being marginally above. The mercury likely originates from the trees used to produce pulp although there is a possibility that the caustic soda supplied by certain manufacturers which still use mercury cells, contains trace levels of mercury.

Since the levels detected in the pre-regulation monitoring program were low, it was agreed that monthly monitoring for mercury would be adequate to determine whether mercury was a problem warranting further investigation under the limits regulation.

Hydrides, ATG 10, were found in very low concentrations, marginally above the method detection limit. The Industry's pre-regulation monitoring data only detected arsenic in the effluent but in no case was the concentration greater than that detected in the intake water. The Ministry's data also indicated the presence of antimony or selenium in certain mill effluents.

Compounds of these elements are not used in pulp and paper manufacturing operations and their occurrence in effluents is attributed to their presence in the wood and raw water used in the operations. Given these facts and the fact that they were found at such low concentrations, it was agreed that further monitoring for these compounds was not warranted.

Cyanides, ATG 2, were detected at very low levels at some mills in the pre-regulation monitoring program.

The Regulation Writing Sub-Committee agreed that further monitoring for cyanides should not be required given the low levels at which they were detected in the pre-regulation monitoring program and the fact that they are not used or expected to be produced in pulp and paper manufacturing operations.

ORGANICS:

Table 4 indicates that a number of organic compounds from EMPPL were detected but only a few were found to be common to all mills or to mills within a category.

Chloroform was detected at every mill with the largest concentrations being found at the nine kraft mills, all of which have chlorine-based bleaching operations. It is known that chloroform can be produced in bleaching operations that use chlorine compounds, particularly hypochlorite, and it is also known that chloroform can be produced if raw water is treated with chlorine for disinfection purposes. Most mills treat their raw water with chlorine, particularly during summer months, and this is the most likely source of the chloroform found at the other 18 mills.

The Regulation Writing Sub-Committee agreed that monthly monitoring for chloroform was adequate.

Methylene Chloride was found at every mill. It was generally agreed that this finding could be attributed to laboratory contamination since methylene chloride is a common analytical artefact in most laboratories. Methylene chloride is used as a solvent and is known to be present at relatively high background levels in the laboratory environment.

Although reported as present in relatively high concentrations in all mill effluents, because it is a known analytical artefact, the Regulation Writing Sub-Committee agreed that there would be little merit in requiring high-frequency monitoring for this compound since the results would be difficult, if not impossible, to interpret.

Three **Phthalate compounds** were found at every mill. It is known that phthalates are used in many plastics as plasticizers and are another analytical artefact, often showing up in laboratory analyses as a result of the use of plastic tubing, containers, etc. As in the case of methylene chloride, it was agreed that there would be little merit in requiring high-frequency monitoring for these compounds.

Toluene appeared in a large number of mill effluents but generally in low concentrations. One mill for which a high concentration of toluene was reported, used the material as a solvent in its processing but this operation is now shut down. The presence in the other mill effluents is difficult to explain other than as a contaminant introduced by laboratory or maintenance operations.

Because this is not a compound normally associated with pulp and paper making operations and because it was detected in very low levels except for the one case already mentioned, the Regulation Writing Sub-Committee agreed that high-frequency monitoring was not warranted for toluene.

Phenol was found at most mills. This is one of the more surprising findings of the pre-regulation monitoring program although it is known that phenol can be produced during the chemical pulping of wood. Of the three mills which showed very high levels of phenol, two manufacture corrugating medium using a high percentage of hardwood as furnish and the third is a kraft mill which periodically uses a large percentage of hardwood in its furnish. (It is known that effluents resulting from hardwood pulping are likely to contain more phenol than those resulting from softwood pulping.) Another possible source of phenol in mill effluents is the use of phenol-formaldehyde resins in the manufacture of board and paperboard products.

Although the high levels of phenol found at three of the mills were grounds for phenol to be considered for high frequency monitoring, the relatively low levels found at the other mills did not warrant high frequency monitoring for all mills. The Regulation Writing Sub-Committee agreed that monitoring for phenol should be limited to once per month for all mills.

Total Alkyl Lead, ATG 13, was not analyzed for in the pre-regulation monitoring program. This compound is not associated with pulp and paper operations, being a compound specifically related to the Organic and Petroleum sectors.

Water soluble Volatiles, ATG 18, were not analyzed for in the pre-regulation monitoring program. These compounds are considered to be specific to the organic chemical sector and are not expected to occur in pulp and paper wastes.

Pesticides and Herbicides, ATG's 21 and **22**, were detected in Round 1 of the Industry's pre-regulation monitoring program but problems were encountered with the analyses. On being informed of these problems, the Ministry acknowledged that pesticides, particularly pesticides which contain high levels of chlorinated organics, could not be identified in pulp and paper mill effluents using the current analytical protocols for these groups. It was agreed, therefore, that monitoring for these groups be deferred pending further investigation by the Ministry.

Chlorinated dioxin and dibenzofuran, analyses were not carried out by the Industry or the Ministry during the pre-regulation monitoring program. The protocols for analyzing these compounds in pulp and paper mill effluents were under review following some difficulties encountered in the USEPA/American Paper Institute (API), "Five Mill Study." Revised protocols were not available from the Ministry before the monitoring program was complete.

Solvent extractables, were not monitored in the pre-regulation monitoring program. Although oil and grease may be present in pulp and paper wastes, there are many other compounds which may also be soluble in the solvent used for the analysis, thereby creating the potential for erroneous interpretation of the results. This test group was not considered appropriate for pulp and paper mill effluents.

Polychlorinated Biphenyls (PCB's), **ATG 27**, were not detected in the pre-regulation monitoring program. Although the United States EPA recognized PCB's as a potential contaminant from mills that operated waste paper deinking processes, the manufacture of PCB's and their use in inks has been prohibited in Canada for more than 10 years which means their presence in waste paper is unlikely. Also, studies in Sweden have determined that PCB's are not formed during bleaching operations. These results were was expected, since the chemical structure of the lignin molecule precludes lignin from being a precursor for PCB formation.

Since PCB's are highly regulated in Ontario and may only be stored in closed containers placed in approved containment areas, the potential for finding PCB's in mill effluents is close to zero.

The Regulation Writing Sub-Committee agreed that semi-annual monitoring for PCB's would be adequate bearing in mind that no PCB's had been detected in the pre-regulation monitoring program.

CONVENTIONAL MONITORING PARAMETERS:

Cyanides were detected at very low levels in the Industry's pre-regulation monitoring program at ten of the mills but were not detected in the remaining 17. Cyanides are not used in pulp and paper processing operations and there is no evidence to suggest that they are formed during processing.

Sulphides were not monitored in the pre-regulation monitoring program although they are known to be present in kraft mill cooking liquors and condensates. Although sulphides are toxic, the literature does not appear to implicate them as contributors to kraft mill effluent toxicity, probably due to the ease with which they are oxidized, particularly by any residual chlorine that may be present.

OPEN CHARACTERIZATIONS:

Table 3 indicates the chemical compounds or compound groups tentatively identified by the "open organic scans" performed by the Industry and the Ministry during the pre-regulation monitoring program. As can be seen, the list is rather large and none of the compounds detected appear on EMPPL.

EMPPL represents the list of toxic contaminants which have been screened to-date by the Ministry and found to be of concern. Of the total list, analytical protocols exist for about only 140 compounds and, for the most part, protocols do not exist for compounds not on the list. The lack of a protocol means that it is not possible to conduct acceptable qualitative analysis under the MISA monitoring program.

Compounds tentatively identified in the open scan data will be screened through the EMPPL screening process to determine whether they are of concern. Where concerns are identified, it will be necessary to positively identify the presence of the specific compound by more detailed analysis and then develop analytical protocols. Protocol development normally takes about one year to complete and new compounds may be added to EMPPL provided protocols are developed before the regulation is promulgated. If protocols are not developed before promulgation of the regulation, monitoring for these compounds may be required later under a limits regulation.

6. SAMPLING AND FLOW MEASUREMENT

In mid-1987, the Ministry at the recommendation of the Joint Technical Committee, commissioned the consulting firm, CANVIRO, to undertake a study to review the adequacy of existing flow measurement and sampling equipment at each of the 27 mills. The report, "Flow Measurement and Sampling Study for the Pulp and Paper Sector in Ontario," was tabled before the JTC in March of 1988. As well as documenting the flow measurement and sampling devices, the report also documented the number and types of the major effluent streams at each mill.

For the purpose of the regulation development, the information contained in the CANVIRO report was used in combination with the Industry's knowledge of individual mills to characterize the number and types of effluent streams which would require monitoring. In most cases, the effluent streams, the sampling locations and the flow measurement locations identified for monitoring purposes were the same as those presently in use at the mills. Some mills, however, have indicated in writing their intention to make changes to certain monitoring stations as a result of decisions to combine multiple outfalls into a single outfall or to install new flow measurement and sampling devices.

Recognizing that these changes would not likely be forthcoming before the regulation was promulgated, it was decided to develop a regulation which would be general, covering the types of effluent to be monitored and the monitoring parameters required for each type of effluent. By doing this, amendments to the regulation in the future as monitoring stations are changed, will be avoided.

The sampling points identified for the effluent streams at each mill were examined to determine whether they would yield information necessary to characterize the operations at the mill. Special attention was paid to those mills which operated more than one pulping process.

In the case of mills operating both sulphite and mechanical pulping, it was not considered necessary to differentiate between the effluents from both operations since the concerns with both types of operation are similar. BOD5 and toxicity due to resin and fatty acids are the main areas of concern for these mills.

At one kraft mill, the Ministry has agreed to allow the mill to take separate samples from the acid and alkaline sewers and combine them into a single sample for the purposes of the monitoring regulation. The two streams do subsequently combine in a channel prior to discharge to the receiver and it is known that the combined stream exhibits different characteristics from those of the individual streams.

The Ministry is requiring the monitoring of cooling water streams. Cooling water streams are identified in the CANVIRO report even though many of them are not routinely monitored under current Ministry requirements. Also, monitoring is being required for backwash effluents from intake water treatment plants, emergency overflow discharges and any continuous effluents from waste disposal sites. These discharges were not identified in the CANVIRO report but such discharges are known to occur.

Limited storm water monitoring is being required at most mills. Since the purpose of the storm water monitoring is to obtain a preliminary assessment of the impact potential of storm water discharges on surface waters, twice yearly sampling is recommended for those point source discharges selected for monitoring at the mills. This frequency will provide an industry-wide data base of 110 samples.

The report, "A Survey Of Stormwater Runoff At Ontario Pulp And Paper Mills," prepared by Beak Consultants Limited, provided information on the point and non-point storm water discharges at each mill in Ontario. This information was not previously known to the Ministry and the report proved to be very valuable in forming the basis for storm water monitoring requirements. The report categorized the storm water discharges and rated each one on the basis of the land uses of the respective catchment areas. Based on the ratings, the Regulation Writing Sub-Committee agreed that storm water discharges which originated from catchment areas having the following land uses should be monitored:-

- storage/unloading
- wood storage
- chip storage
- coal storage
- waste paper
- disposal sites
- bark storage

Using this criterion, 55 point source discharge points were identified for monitoring. These 55 discharge points are located at 19 of the mills. The remaining 8 mills are not being required to monitor any storm water discharges.

7. FREQUENCY OF SAMPLING

To assist with the selection of the frequencies with which samples should be collected under the monitoring regulation, the Ministry consulted its own statistician and reviewed practices in other jurisdictions, most notably, the USEPA.

The number of samples needed to estimate the average concentration of a parameter to within some prescribed accuracy can be determined if some statistical measures are known, specifically the variability of the data or the coefficient of variation, and an acceptable relative error in the estimate of the mean.

At the beginning of a new sampling program a reliable value for the variance or the coefficient of variation is not available and because of the lack of historical data the variance or the coefficient of variation may have to be estimated using best judgement.

If we assume the data generated by the sampling program will be approximately normally distributed and the variance is not known with assurance, the " Student's t " distribution may be used in place of the standard normal distribution.

In determining an acceptable frequency of sampling, some knowledge of the expected variability and acceptable relative error in the estimate of the mean is required. Such information was not available for the chemicals or parameters of interest and, therefore, the Ministry had to make certain assumptions. It was assumed that a relative error of 25% in the estimate of a mean would be acceptable at a 95% significance level and that a value in the range of 0.40 to 0.50 for the coefficient of variation could be assumed for a moderately variable parameter. This resulted in a sample size in the range of 12 to 15 as being necessary to estimate a mean within the 25% error range.

Recognizing that the cost of monitoring per event would be relatively high, a value of twelve was taken for the sample size. Increasing the sample size to fifteen, for example, would not likely yield a sufficient decrease in the relative error to justify the projected increase in costs. In general, therefore, for the purposes of monitoring, the minimum number of samples which should be collected is twelve.

8. DEVELOPMENT OF THE SECTOR CHARACTERIZATION LIST

Under the MISA program, each industrial sector is required to perform frequent testing of its effluents for the analytical test groups (ATG) in Schedule 1 to the General Effluent Monitoring Regulation that are relevant to the sector. This testing is known as "sector characterization."

The sector characterization list for this sector was developed on the basis of the pre-regulation monitoring data and best practicable judgement on the part of the Regulation Writing Sub-Committee. The list comprises the majority of the analytical test groups in Schedule 1. Within analytical test group 19, the requirement is to analyze only as far as "pyrene" since the balance of the compounds in this test group are not normally associated with pulp and paper manufacturing.

Certain parameters that are deemed relevant to the sector are not included in Schedule 1 to the General Effluent Monitoring Regulation. These are:-

ATG PP1 - BOD5
ATG PP2 - Adsorbable Organo Halide (AOX)
ATG PP3 - Dichlorodehydroabietic Acid

Schedule L to the Pulp and Paper Effluent Monitoring Regulation is the sector characterization list and includes the three parameters above.

ATG's Omitted from the Sector Characterization List

Total Cyanide, ATG 2

Cyanides were omitted for the reasons given in Section 5, Analysis of Pre-Regulation Monitoring Data.

Hydrides, ATG 10

Hydrides were omitted for the reasons given in Section 5, Analysis of Pre-Regulation Monitoring Data.

Hexavalent chromium, ATG 11

The presence of hexavalent chromium might be expected in cases where chromate compounds are used as rust inhibitors in cooling waters. Also, hexavalent chromium is known to be a potential contaminant of sodium chlorate used in the manufacture of chlorine dioxide at Ontario kraft mills. Since hexavalent chromium is not expected to be present in significant concentrations in mill effluents and will be accounted for in the determination of total chromium under ATG 9, the Regulation Writing Sub-Committee agreed that this parameter should be excluded from the list.

Total Alkyl Lead, ATG 13

This class of compounds is specific to the organic chemical and petroleum sectors and is not normally associated with pulp and paper manufacturing operations. For this reason, the Regulation Writing Sub-Committee agreed that this parameter should be excluded from the list.

Phenolics, ATG 14

This test is a non-specific test originally developed for the determination of "reactive" phenols in wastewaters and was not used in the pre-regulation monitoring program. The test has limited application to pulp and paper mill effluents because it relies on the formation of a coloured derivative which experiences interference from coloured polymeric compounds present in the effluents. It is known also, that a large number of phenolic constituents in pulp and paper mill effluents are unreactive to 4-amino-antipyrene. The value of the test is questionable, therefore, since it is not possible to know what compounds are being measured by the test or how to interpret the test results.

Because of these concerns with the test, the Regulation Writing Sub-Committee agreed that this test group should be excluded from the list.

Water Soluble Volatiles, ATG 18

The compounds in this test group are considered to be specific to the organic chemical sector and were not monitored in the pre-regulation monitoring program.

There is no evidence to suggest that these compounds could be present in pulp and paper mill effluents, nor are they used in pulp and paper manufacturing operations. For these reasons, the Regulation Writing Sub-Committee agreed that this test group should be excluded from the list.

Pesticides and Herbicides, ATG's 21 & 22

As mentioned earlier, severe problems were encountered with the analyses for these groups in the pre-regulation monitoring program. The matter is under investigation by the Ministry and if it is resolved before the regulation is promulgated, consideration will be given to including these test groups in the list.

For the present, the Regulation Writing Sub-Committee agreed that these groups should be excluded from the list.

Solvent Extractables, ATG 25

This classical test is often used for the determination of mineral hydrocarbons in aqueous samples, commonly referred to as "oil and grease." The test is non-specific, quantifying a group of substances with common solubility in the extraction solvent used and not quantifying an absolute quantity of a specific substance. Pulp and paper mill effluent is a complex matrix containing many organic substances that could become dissolved in the extraction solvent used for the test. Consequently, any intent to apply this test for the sole purpose of determining the possible presence of oil and grease in mill effluents will yield results which are meaningless and potentially misleading.

An acidified mill effluent can potentially contain many types of organic substances which will be soluble in the extraction solvent. Lignin degradation products, wood extractives, (resin and fatty acids) and low molecular weight pulping and bleaching by-products will all dissolve in the solvent in a non-specific and non-predictable manner. This would then lead to the reporting of elevated levels if the intention is to determine the levels of "oil and grease."

A proper determination of hydrocarbons in pulp and paper mill effluent is only possible using component-specific gas chromatographic techniques. For these reasons, the Regulation Writing Sub-Committee agreed that this test group should be excluded from the list.

9. PARAMETERS TO BE MONITORED

This section outlines the parameters and the frequency of monitoring that were recommended by the Regulation Writing Sub-Committee and endorsed by the Joint Technical Committee for inclusion in the monitoring regulation.

The selection of parameters and the frequency of monitoring was based on analysis of the pre-regulation monitoring data and the best practical judgement of the Regulation Writing Sub-Committee. An attempt was made to arrive at agreement on a set of rules which could be used to determine the frequency at which specific compounds or groups should be monitored. However, because so few EMPPL compounds were detected in mill effluents in the pre-regulation monitoring program and even fewer were common to all mill effluents, it was not possible to reach agreement on a set of rules. Instead, the committee agreed to deal with each parameter individually, recognizing that the goals and objectives of the MISA monitoring program should not be overlooked.

9.1 PROCESS EFFLUENTS

DAILY MONITORING

This category of monitoring is used for conventional parameters which normally serve as indicators of process variability and which are traditional candidates for limits control.

Chemical Oxygen Demand/Dissolved Organic Carbon (COD/DOC)

All mills are being required to analyze for one or other of these two parameters on a daily basis.

These parameters will provide basic information on the daily variability of mill effluents and reflect variability in mill operations The data base which will be collected may be used to determine whether any useful correlation can be developed between COD, DOC and BOD5. If a correlation can be developed, it could potentially allow the phasing-out of BOD5 as a control parameter.

A large number of mills are already conducting COD or DOC analyses for internal control purposes. The imposition of this requirement, therefore, will not represent a major additional cost burden.

Industry may wish to install continuous monitoring for DOC as a cost saving measure which is why it is being provided as an alternative to COD.

Total Suspended Solids (TSS)

Total suspended solids is being required on a daily basis. TSS is a conventional parameter which is of importance in this sector because pulp and paper mill operations generate substantial quantities of suspended solids which must be removed before the effluents are discharged to a watercourse. All mills in Ontario have installed treatment facilities for the removal of suspended solids but the data gathered under the monitoring program will provide a base for the establishment of a regulated limit for this parameter.

Consideration was given to requiring volatile suspended solids but VSS is a parameter more appropriately used in the control of biological treatment processes. Also, since the bulk of the suspended solids generated in this sector comprises wood fibres, VSS information would be of little use. For these reasons, VSS was not included as a daily requirement. It is being required on a weekly basis for those mills which operate biological treatment systems where it will provide an indication of the amounts of biological solids being discharged.

pH

This parameter is currently being monitored at most mills under other requirements of the Ministry. It is a conventional parameter and is useful in providing basic information on the variability of mill effluents and reflects variability in mill operations, particularly with respect to spills and plant upsets.

Specific Conductance

This parameter will be used in conjunction with BOD5 and pH data to provide basic information on the variability of mill effluents and the frequency of spills and plant upsets.

THRICE WEEKLY MONITORING

BOD5

This parameter is a conventional parameter which has been monitored in this sector for years. It provides a measure of the amount of biodegradable organic material being discharged in a mill effluent. The BOD5 loading to a receiving watercourse can be correlated with dissolved oxygen levels and is a useful control parameter in cases where the potential exists for oxygen depletion.

Although mills have traditionally monitored this parameter on a daily basis, because COD/DOC is being required on a daily basis the Regulation Writing Sub-Committee agreed that thrice weekly monitoring would be adequate to provide sufficient data points for establishing limits.

Resin and Fatty Acids

Resin and Fatty Acids are found at all mills which produce pulp from raw wood. Chlorinated resin and fatty acids are produced in operations which use chlorine or chlorine derivatives to bleach raw wood fibre. Both the non-chlorinated and chlorinated resin and fatty acids are known to be toxic.

Since kraft, sulphite, mechanical and corrugating mills all produce pulp from raw wood, the Regulation Writing Sub-Committee agreed that they should be required to monitor for resin and fatty acids on a thrice weekly basis.

To reduce the cost of RFA monitoring, the committee agreed that surrogate compounds would be used for the thrice weekly monitoring but that the total group, ATG 26, would be monitored on a monthly basis. This will be accomplished under the monthly sector characterization.

The surrogate compounds for kraft mills will be dehydroabietic acid (DHA) and dichlorodehydroabietic acid (DCHA). DHA is the most stable of the resin acids, is found in the effluents of all mills which pulp wood and is the compound used for calibrating the analytical equipment. Other resin and fatty acids are less stable and are prone to break down during sample storage. DCHA is the most stable of the chlorinated resin acids and is considered the most suitable surrogate for the chlorinated compounds.

The surrogate compound for sulphite-mechanical and corrugating mills will be dehydroabietic acid only since none of the mills in these categories use chlorine or chlorine derivatives for bleaching wood fibres.

The technology used to treat resin and fatty acids (biological treatment) is common to all compounds in the group which means that controlling the levels of the surrogates will also ensure reductions in the other acids in the group. It will probably only be necessary, therefore, to establish limits for the surrogate parameters to ensure effective control of the whole group.

Organo-chlorine (AOX)

All nine of the kraft mills bleach at least some of their production using chlorine and chlorine derivatives. The Regulation Writing Sub-Committee agreed, therefore, that kraft mills should be required to monitor thrice-weekly for AOX.

The alternative to using a surrogate would be to require monitoring for a lengthy list of individual chlorinated compounds. Protocols only exist for a few such compounds and the Ministry would likely encounter difficulties in trying to establish limits on individual organo-chlorine compounds because data on the application of BATEA is not available for most of these compounds. The use of AOX is a more practical approach and will allow limits to be established which will inherently greatly reduce the discharge of individual organo-chlorine compounds

A similar approach is being used in Sweden where limits on the discharge of TOCl (Total Organic Chlorine) have been set. TOCl is a test which was developed in Sweden but is slightly more complex than the AOX test and, therefore, less desirable for monitoring purposes. The TOCl test also gives a value which is significantly less than that for the AOX test when performed on the same sample.

WEEKLY MONITORING

Total Phosphorus and Nitrogen

These parameters are being required for mills which operate biological treatment systems with the addition of nutrients. Nutrient additions are often necessary for the efficient operation of bio-systems and the discharge of excess nutrients to a receiver could be cause for concern.

Since the concentrations of these parameters are not expected to vary widely, the Regulation Writing Sub-Committee agreed that monitoring on a weekly basis was adequate to characterize these parameters.

Volatile Suspended Solids

As discussed earlier, volatile suspended solids is a useful parameter which is often used to differentiate between biological and other suspended solids. In the case of pulp and paper mills, its use for this purpose is somewhat limited because the bulk of the suspended solids discharged by a pulp or paper mill normally comprises wood waste or fibre which will contribute to the level of volatile suspended solids. However, since mills which operate biological systems also have good primary treatment systems which remove the bulk of the suspended solids ahead of the bio-system, the test will potentially provide an indication of the levels of bio-solids being discharged.

The Regulation Writing Sub-Committee agreed that weekly monitoring for this parameter would provide an adequate data base to determine whether bio-solids discharges are a significant problem.

Aluminum

As was discussed earlier, aluminum can be highly toxic in certain natural waters and can be deleterious to the growth and survival of fish. For these reasons, the Regulation Writing Sub-Committee agreed that aluminum should be a candidate for high-frequency monitoring.

In further discussions, it was pointed out by the Industry that the concentrations of aluminum in respective mill effluents would likely not vary significantly because mills tend to use constant dosages of aluminum salts in their manufacturing operations.

The committee finally agreed that weekly monitoring would be acceptable for this parameter. This would produce 52 data points per mill. Also, it can be expected that the data produced for various categories of mills will be able to be lumped together to form an expanded data base for each category if needed.

Zinc

As was discussed earlier, zinc is known to be toxic and to accumulate in aquatic organisms but the concentrations of zinc in respective mill effluents are expected to remain fairly constant.

Using a similar rationale as that used for aluminum, the Regulation Writing Sub-Committee agreed that weekly monitoring would be appropriate for this parameter.

MONTHLY MONITORING

Nitrogen and Total Phosphorus

Monitoring of these parameters will provide an indication of nutrient loadings to the receivers. Under the Canada/Ontario Great Lakes Agreement, there is an onus on Ontario to provide data on phosphorus discharges to the Great Lakes.
Recognizing these concerns, the Regulation Writing Sub-Committee agreed that monthly monitoring should be conducted at all mills.

Sulphide

Although sulphide was not monitored in the pre-regulation monitoring program, due to its known toxicity and potential presence in kraft mill effluents, the Regulation Writing Sub-Committee agreed that monthly monitoring of kraft mills process effluents for sulphide should be required.

Resin and Fatty Acids

As discussed earlier, the Regulation Writing Sub-Committee agreed to monthly monitoring for the full range of RFA's in ATG 26 and thrice weekly monitoring of specific surrogate RFA compounds.

Organo-chlorine (AOX)

The Regulation Writing Sub-Committee agreed that AOX monitoring should be required at any mill which uses chlorine or chlorine derivatives for pulp bleaching or brightening. It was agreed that all kraft mills would be required to monitor for AOX thrice weekly but it was felt this would be an excessive requirement for mills which only use chlorine compounds for pulp brightening.

Currently, other than the kraft mills, only one small mill which manufactures fine papers from deinked, recycled paper uses chlorine compounds for brightening. The amount of organo-chlorines expected from this operation is small.

The Regulation Writing Sub-Committee agreed that monthly monitoring would be adequate in this case to determine whether AOX discharges are a potential problem at this type of mill.

Chlorinated Dioxins and Dibenzofurans

It is known that chlorinated dioxins and dibenzofurans can be formed in processes which use chlorine and/or chlorine derivatives to bleach fibre and it is reasonable to assume that they could be found in the effluents of any mill which produces or uses pulps which have been bleached with chlorine or chlorine derivatives.

Ontario has nine kraft mills and one fine paper mill which are currently manufacturing bleached or brightened pulps using chlorine and/or chlorine compounds.

Ideally, it would be highly desirable to conduct a detailed chlorinated dioxin and dibenzofuran monitoring program within each mill, particularly around the bleach plant operations. With this type of a monitoring program, a more accurate assessment of the total chlorinated dioxin and dibenzofuran discharges could be made. Industry pointed out, however, that the Pulp and Paper Research Institute of Canada is conducting a large-scale study into the formation and reduction or elimination of chlorinated dioxins and dibenzofurans and that approximately $1 million has already been spent on the study.

On the understanding that the study results would be made available to the Ministry, it was finally agreed that only final effluent discharges would be monitored.

Results of the study to date, published in October 1988, indicated that the mechanisms by which chlorinated dioxins and dibenzofurans are formed in mills are now known and that methods for potentially minimizing or preventing their formation have been developed. The industry is now evaluating the application of these methods at actual mills.

It was finally agreed that mills which use chlorine or chlorine derivatives for bleaching or brightening would be required to monitor for chlorinated dioxins and dibenzofurans on a monthly basis.

Sector Characterization.

The Ministry adopted a position that 12 sector characterizations were necessary to complement the very small list of individual parameters selected for high-frequency monitoring. Industry argued that 12 was excessive because at least five characterizations had been conducted for each mill in the pre-regulation monitoring program.

After considerable discussion both within and outside the committee, the Regulation Writing Sub-Committee agreed to a requirement of monthly sector characterizations.

Separate monthly monitoring is not being required for those analytical test groups which are monitored on a daily, thrice weekly and weekly basis since it was agreed that at least one of each of the daily, thrice weekly and weekly samplings would qualify for the monthly sector characterization requirement.

The remaining analytical test groups which are required to be monitored on a monthly basis for sector characterization are:-

Total Metals - ATG 9

Mercury - ATG 12

Sulphide (kraft only) - ATG 15

Volatiles, halogenated - ATG 16

Volatiles, non-halogenated - ATG 17

Base neutral extractables - ATG 19

Acid extractables - ATG 20

Neutral extractables - ATG 23

Resin and Fatty Acids - ATG 26

Toxicity

LC50, 96hr, Rainbow Trout and LC50, 48hr *Daphnia magna* toxicity testing is being required by the Ministry on a monthly basis for all process effluent streams at all mills. This is Ministry policy and was not negotiable.

The rainbow trout testing will provide information an the acute toxicity of the effluents and allow comparison with other historical or reported data.

The *Daphnia magna* testing will provide information on the suitability of this test as a possible replacement for the rainbow trout test. Daphnia are generally more sensitive and respond more rapidly to toxicants than fish. Also, because of their small size, only small amounts of effluent are required for each test.

In the case of rainbow trout testing, should the results for three consecutive months prove the effluent to be non-lethal, the frequency of testing will be reduced to once every three months, for a total number of 6 tests. This relief will not apply in the case of the *Daphnia magna* testing.

BI-MONTHLY MONITORING

Chlorinated Dioxins and Dibenzofurans

For mills which continuously use but do not manufacture bleached pulp in their operations, the Ministry adopted a position that chlorinated dioxins and dibenzofurans monitoring should be required 12 times per year. The Industry argued that this was an excessive requirement and would be particularly onerous on some of the smaller mills. To support this position, Industry tabled a report before the Regulation Writing Sub-Committee which documented that chlorinated dioxins and dibenzofurans would not be found in the effluents of most of these mills using the method detection limits currently employed by the Ministry.

The Misa Advisory Committee, in its review of the draft regulation, recommended that the level of testing should be reduced to 6 times per year.

Acting on the advice of the Misa Advisory Committee, the Regulation Writing Sub-Committee agreed to testing on a bi-monthly basis.

For those mills which use bleached pulp intermittently, normally under emergency situations to replace other types of pulps, the Regulation Writing Sub-Committee agreed that monitoring should be conducted once per month, at a time when the mill is using bleached pulp, for every month in which bleached pulp is used, up to a maximum of six tests.

SEMI-ANNUAL MONITORING

Chlorinated Dioxins and Dibenzofurans

As part of the issue of chlorinated dioxins and dibenzofurans monitoring, the Regulation Writing Sub-Committee debated the question of the frequency of monitoring for those mills which do not manufacture or use bleached pulp. There is little likelihood of finding chlorinated dioxins and dibenzofurans in the effluents of these mills but it was recognized that some monitoring would be required to document their absence.

The Regulation Writing Sub-Committee finally agreed that semi-annual monitoring for these mills would be appropriate.

Open characterization

Given that three open characterizations were performed in the pre-regulation monitoring program and that one additional characterization will be performed by the Ministry as part of the Ministry audit program, the Regulation Writing Sub-Committee agreed that two open scans should be required.

Inorganic open characterizations (ATG 29) are not being required since the Regulation Writing Sub-Committee considered the testing for metals (ATG 9) which is being required under the sector characterization to be adequate for characterizing pulp and paper mill effluents.

Due to the large number of compounds present in most pulp and paper mill wastes, it can be argued that characterizations can only be considered indicative of some of the compounds present and each test is likely to yield slight differences from the one before. For this reason, performing additional characterizations is unlikely to yield more useful information and would be an unnecessary cost burden on the Sector.

9.2 COOLING WATER EFFLUENTS

MONTHLY MONITORING

The Regulation Writing Sub-Committee agreed that testing for COD/DOC, total suspended solids, pH and specific conductance on a monthly basis would be adequate to characterize cooling water effluents and to determine whether they are contaminated with process wastes.

Toxicity testing is being required on all cooling water discharges on a monthly basis as Ministry policy. A mechanism is provided whereby the frequency of toxicity testing may be reduced to quarterly if during the testing, 5 or more of the 10 fish survive at each dilution in each of three consecutive monthly tests.

Where chromium or zinc containing additives are used as corrosion inhibitors or conditioners, there is an additional requirement to monitor for these two metals on a monthly basis.

9.3 WASTE DISPOSAL SITE EFFLUENTS

MONTHLY MONITORING

BOD5,suspended solids,nitrogen, phosphorus and pH are conventional parameters which the Regulation Writing Sub-Committee agreed should be required for any leachate which flows continuously from a waste disposal site. Monthly monitoring of these effluents is considered adequate to provide preliminary information on the quality of the discharges from these sites.

Total metals, ATG 9, and mercury, ATG 12, are being required additionally for any waste disposal site which receives chemical sludges or muds resulting from mill operations.

The committee also agreed that Acid extractables, ATG 20, and Resin and Fatty Acids, ATG 26, should be required as part of the monthly monitoring since bark and wood wastes which can give rise to these parameters, are disposed of at these sites.

9.4 BACKWASH EFFLUENTS

MONTHLY MONITORING

The Regulation Writing Sub-Committee considered COD/DOC, pH and total suspended solids to be an adequate list of parameters for the monitoring of backwash effluents from mill intake water treatment operations. Monthly monitoring is deemed sufficient to characterize these discharges which primarily contain the suspended solids removed in the treatment operations.

Where aluminum salts (alum) are used to enhance the removal of solids or turbidity from the intake water, the committee considered that monitoring for aluminum (ATG 9) should also be required.

9.5 EMERGENCY OVERFLOW EFFLUENTS

PER EVENT

From its knowledge of the industry, the Regulation Writing Sub-Committee acknowledged that emergency overflows are part of the day-to-day operations at most mills. In many cases, however, emergency overflows are conveyed into process sewers and will be monitored as part of the process effluent. The committee agreed, therefore, that this section of the regulation should only deal with those emergency overflows that would not be monitored by other requirements of the regulation.

Emergency overflows are defined as those overflows which bypass any treatment system prior to discharge to a surface watercourse and the committee agreed that monitoring for COD/DOC, pH, specific conductance and total suspended solids would be appropriate to determine whether further investigation of these streams would be warranted under the limits regulation.

Requiring the mills to monitor for additional parameters was considered. As most emergency overflows are of short duration or can be expected to contain the same compounds as process effluents, more detailed characterization at this time was considered unnecessary.

9.6 STORM WATER EFFLUENTS

SEMI-ANNUALLY

Storm water monitoring is being required on a limited basis at a number of mills.

The CANVIRO report identified nearly forty separate point-source, storm water discharges and the Industry reported in excess of fifty. To obtain a more accurate picture of the storm water discharges a consultant was retained by the JTC to review the storm water discharges at each mill, classify and rate the discharges according to their potential impact on the environment and to make recommendations with respect to which discharge points should be monitored.

The consulting firm, Beak Consultants Ltd, submitted its report in November 1988. The report indicated a total of 247 storm water discharges at the 27 mills in Ontario. Of that total, 139 are point sources discharging directly to surface watercourses either through closed pipes or open channels and the remaining 108 are non-point, diffuse discharges.

It is interesting to note that although there are a large number of discharge points, the storm water contribution to the total effluent discharged from the industry is relatively small. The estimated annual volume of storm water discharged from all 27 mills, (point sources, diffuse sources and storm water entering mill process effluent sewers) is less than 1% of the annual volume of effluent discharged by the 27 mills. Further, the estimated annual volume of storm water discharged directly to surface watercourses that may contain parameters of concern, (based on the consultant's assessment) is less than 0.5% of the annual volume of effluent.

Storm water runs off a variety of catchment areas on mill sites. Of the catchment areas identified by the consultant, the most likely to have storm water that may contain parameters of concern and for which monitoring is recommended are the following landuse types:-

- storage/unloading
- wood storage
- chip storage
- coal storage
- waste paper
- disposal sites
- bark storage

The Regulation Writing Sub-Committee, based on recommendations of the Storm Water Sub-Committee, recommended that monitoring be required only for certain point source discharges since sampling and flow estimation for diffuse sources is extremely difficult. In addition, where a mill has more than one catchment area which is used for the storage of wood, chips, bark, waste paper or coal, the committee recommended that the mill only be required to monitor the largest of the catchment areas for each land use category. Monitoring is being required at a total of 55 point source discharges among 19 mills. Grab samples are recommended.

Schedule K of the regulation indicates the recommended analytical parameters for each land use category. These parameters were developed largely on the basis of the Beak report and additional concerns that were expressed by the Ministry to the committee.

10. QUALITY ASSURANCE/QUALITY CONTROL

Quality assurance and quality control (QA/QC) encompass all of the procedures undertaken to ensure that the data produced are generated within known probability limits of accuracy and precision.

Quality assurance is the overall verification program which provides producers and users of data the assurance that predefined levels of confidence are met. Quality assurance comprises two elements: quality control and quality assessment.

Quality control is the overall system of guidelines, procedures and practices which are designed to regulate and control the quality of products or services to comply with previously established performance criteria and standards.

Quality assessment is the overall system of activities which ensure that quality control is being performed effectively. This is carried out immediately following quality control and involves evaluation and auditing of quality control data to ensure the success of the quality control program.

QA/QC is one of the most important aspects of the MISA monitoring regulations. The QA/QC program includes many of the small but essential activities ranging from proving the cleanliness of sample bottles, using proper sampling equipment, containers and preservatives, calibrating instruments, validating the authenticity of standards, through to documenting performance. Omission of one of these activities can lead to unreliable data resulting in improper conclusions and perhaps inappropriate actions.

In order to verify the procedures being used, all mills are being required to run a number of quality control samples in addition to the regular samples.

11. ECONOMIC CONSIDERATIONS

COST OF MONITORING

Detailed estimates of the capital and operating and maintenance (O & M) costs associated with the five primary monitoring functions and their financial implications are presented in the MOE's Policy and Planning Branch report, "Monitoring Costs and Their Implications for Direct Dischargers in the Ontario Pulp and Paper Industry (August 1989)."

The five primary monitoring functions specified in the Regulation are sampling, flow measurement, chemical analysis, toxicity testing and the reporting of data. In addition, the costs associated with the transportation of samples from the mills to labs located in either Toronto or Montreal were estimated.

Table 11.1 provides a summary of total capital and O & M costs for each monitoring function. (Columns may not sum due to rounding.)

TABLE 11.1

SUMMARY OF CAPITAL AND OPERATING AND MAINTENANCE COSTS

BY MONITORING FUNCTION ($1,000's)

MONITORING FUNCTION	CAPITAL COSTS	O & M COSTS	TOTAL $	TOTAL %
Sampling	$817.7	$1,260.5	$2,078.2	22.5%
Transportation		$155.1	$155.1	1.7%
Flow measurement	$2,798.5	$27.3	$2,825.8	30.6%
Chemical analysis		$3,393.2	$3,393.2	36.7%
Toxicity testing		$302.4	$302.4	3.3%
Reporting	$81.0	$406.4	$487.4	5.3%
TOTALS:	$3,697.2	$5,544.9	$9,242.1	100.0%

Flow measurement installations account for $2.8 million of the total $3.7 million total capital cost estimate while chemical analysis accounts for $3.4 million of the total $5.5 million O & M cost estimate. The actual costs may vary from the estimated costs, because of uncertainties and contingencies, but actual capital costs are expected to differ from the estimates by no more than ± 25% and actual O & M costs, by no more than ±15%. Therefore, the Monitoring Cost Report presents the likely range of incremental costs for each mill.

The capital and O & M costs among each of the four mill sub-categories is shown in Table 11.2. Clearly, the kraft mills bear the largest share of the total $9.2 million estimated cost associated with the MISA monitoring requirements. This is mainly due to the fact that the analytical requirements are more extensive for the kraft mills than for the remaining mills. Point estimates of total incremental monitoring costs for each mill range from $158,500 to $1,227,400.

TABLE 11.2

SUMMARY OF CAPITAL AND OPERATING AND MAINTENANCE COSTS

BY MILL SUB-CATEGORY ($1,000's)

PROCESS CATEGORY	CAPITAL COSTS	O & M COSTS	TOTAL	
			$	%
Kraft	$2,318.5	$2,280.3	$4,598.8	49.8%
Sulphite - Mechanical	$701.2	$1,459.6	$2,160.8	23.4%
Corrugating	$306.0	$531.6	$837.6	9.1%
Deinking-Board-Fine Paper-Tissue	$371.5	$1,273.5	$1,645.0	17.8%
TOTALS:	$3,697.2	$5,545.0	$9,242.2	100.0%

Among the Tables following Part II of this document, Table 7 provides a summary of the estimated analytical costs, including toxicity testing, for samples from each of the various effluent streams potentially to be monitored at each mill. Included also is an estimate of the projected total analytical costs for each mill. These estimates are based on current knowledge of the number of effluent streams at each mill which will have to be monitored. The exact number will not be known until mills submit accurate information in the initial report.

Because the number of discharge points varies from mill to mill, costs are not necessarily in proportion to the size of the mill or production levels. Small mills with a large number of discharge points are faced with a disproportionate cost relative to large mills with a single discharge.

Estimates of the total cost for chemical analysis and toxicity testing at individual mills, range from a low of approximately $83,000.00 to a high of approximately $297,000.00. The average cost per mill is calculated at about $135,000.00. The total cost for chemical analysis and toxicity testing for the sector is estimated at $3.6 million.

For mills in Northern Ontario, samples will most likely have to be transported to the Toronto area, to Montreal or to Winnipeg for analysis because laboratory capability for most of the analytical requirements does not exist locally. Transportation costs for these mills will likely be high.

As discussed in Section 7 (Frequency of Sampling), the monitoring program is based on generating sufficient data for the development of the Limits Regulation. The estimated cost of chemical analysis was compared to costs that would have resulted from an alternative monitoring program requiring more frequent testing of process effluent streams. If, for the purposes of comparing an alternative sampling program, analyses required on a thrice weekly basis were assumed to be required on a daily basis and analyses required on a weekly basis were assumed to be required on a thrice weekly basis, the total cost of chemical analyses would be more than double the original cost. This provides an indication that costs were taken into consideration when developing the frequency of chemical analyses.

Among the Tables following Part II of this document, Table 8 indicates the costs for individual analytical tests used in calculating the total analytical costs for each type of process effluent, a cooling water effluent, a waste disposal site effluent, a backwash effluent, an emergency overflow effluent and each type of storm water effluent.

These costs were determined by the MOE Laboratories after contacting a number of commercial facilities. They are believed to reflect a reasonable average commercial cost. Mills may elect to perform some of the analyses in their own laboratories, presumably at lower cost.

FINANCIAL IMPLICATIONS

The financial implications of the incremental cost of monitoring are also presented in the Monitoring Cost Report. The financial analysis is based on information presented in a report, " The Economic and Financial Profile of the Ontario Pulp and Paper Sector," prepared for the MOE's Policy and Planning Branch by Woods Gordon Management Consultants and updated by Policy and Planning Branch staff. Other sources were consulted as well.

To provide an indication of the implication of the potential capital needs, estimates of incremental capital costs for monitoring were taken as a percentage of average capital expenditures since 1981. The results range from less than 0.1% to 1.5% and, apart from one firm, were 0.8% or less.

Estimates of incremental O & M costs for monitoring were taken as a percentage of average after-tax earnings since 1981 to provide an indication of their impact on profits. Apart from one firm, for which long-term data were not available, these figures range from 0.2% to 3.1%.

Another measure of the estimated effects of O & M costs for monitoring is their impacts on the rates of return on capital employed. For all but the one firm mentioned above, the difference in average rate of return since 1981 would be less than 0.1%.

It is recognized that the pulp and paper industry is quite cyclical and is very sensitive to national and international business conditions. The industry is currently riding the crest of the economic recovery. The Canadian Pulp and Paper Association (CPPA) reports that Canadian newsprint mills operated at 99% of capacity in 1988, surpassing the 1987 level of 98%. Operating rates in 1988 for wood pulp and paperboard production, respectively at 95% and 97% of capacity, were slightly below the rates for 1987. The CPPA also reported that the total production of paper and paperboard exceeded 16.6 million metric tons (tonnes) for 1988, representing a 3.7% increase over 1987 and 9.0% increase over 1986.

Pulp and paper companies are generally experiencing record levels of earnings at present and healthy rates of return on assets and investments. Forecasts for the pulp and paper industry in 1989 suggest that it will be another good year, although perhaps not a banner year like the previous two. The recent appreciation of the Canadian dollar, relative to the U.S. dollar, is likely to depress profits in 1989. As new production capacity comes on stream in 1990 and beyond, prices and profits are likely to be reduced further.

Based on current financial health and short-run prospects of the industry and on financial statistics of the individual firms for which data are available, there is no indication that the incremental costs of the MISA monitoring programme will impose significant burdens on the financial capabilities of firms in the pulp and paper sector.

APPENDIX 1

SUMMARY DATA OF ONTARIO MILLS

Name: **ABITIBI-PRICE INC., FORT WILLIAM DIVISION, THUNDER BAY**

History: The mill was originally established in 1922 as a groundwood mill. Subsequently, a sulphite mill was constructed which operated until the end of 1981 when it was replaced with a chemi-mechanical pulping process.

Manufacturing Summary: Groundwood pulping
Chemi-mechanical pulping
Paper making

Mill Employees: 300

Production: 235 tonne/day groundwood pulp
135 tonne/day chem-mechanical pulp

Saleable product: 383 tonne/day Newsprint

Effluent Treatment: Primary:

Woodroom effluent: Clarifier followed by settling pond
Final mill effluent: 3 settling ponds

Effluent Discharge: 14,160 m3/day to Thunder Bay, Lake Superior

Name: **ABITIBI-PRICE INC., IROQUOIS FALLS DIVISION, IROQUOIS FALLS**

History: This mill is the largest Abitibi-Price newsprint mill in Ontario. The mill was constructed in 1914-15 in conjunction with a series of three hydro-electric generating stations on the Abitibi River. The mill operates a high yield sulphite pulping process (without recovery) and produces groundwood pulp.

Manufacturing Summary: Groundwood pulping
Sulphite pulping
Paper Making

Mill Employees: 1000

Production: 620 tonne/day groundwood pulp
205 tonne/day sulphite pulp

Saleable product: 825 tonne/day Newsprint

Effluent Treatment: Primary:

Final mill effluent: 2 clarifiers in parallel

Effluent Discharge: 53,300 m3/day to Abitibi River.

Name: **ABITIBI-PRICE INC., THUNDER BAY DIVISION, THUNDER BAY**

History: The mill is located in Thunder Bay and was established in 1926. It currently operates a high yield sulphite pulping process and produces groundwood pulp.

Manufacturing Summary:
Groundwood pulping
Sulphite pulping
Paper making

Mill Employees: 325

Production:
320 tonne/day groundwood pulp
120 tonne/day sulphite pulp

Saleable product: 442 tonne/day Newsprint

Effluent Treatment: Primary:

Woodroom: Clarifier
Final mill effluent: 2 settling lagoons

Effluent Discharge: 35,000 m3/day to Thunder Bay, Lake Superior.

Name: **ABITIBI-PRICE INC., PROVINCIAL PAPERS DIVISION, THUNDER BAY**

History: The mill is located in Thunder Bay and was originally constructed as a sulphite mill in 1919. In 1922 the mill began its first paper production and later, groundwood pulp production was added. In 1978 the sulphite pulping process was shut down and the mill now purchases market pulps to provide furnish.

Manufacturing Summary: Groundwood pulping
Paper making

Mill Employees: 250

Production: 125 tonne/day groundwood pulp

Saleable product: 442 tonne/day fine and coated papers

Effluent Treatment: Primary:

Woodroom effluent: Clarifier
Mill effluent: Settling Pond

Effluent Discharge: 47,000 m3/day to Thunder Bay, Lake Superior.

Name: **BEAVERWOOD FIBRE CO. LTD., THOROLD**

History: The mill was established in Thorold in 1913, producing a variety of board and paper products. Prior to 1976 the mill produced groundwood pulp and purchased market pulp and waste paper products to manufacture newsprint and board. The mill now uses 100% purchased recycled waste paper and board as feedstock and no longer manufactures newsprint.

Manufacturing Summary: Waste paper and board pulping
Paperboard formation

Mill Employees: 160

Saleable product: 273 tonne/day paperboard

Effluent Treatment: Primary:

Final mill effluent: Clarifier and emergency spill pond.

Effluent Discharge: 14,000 m3/day to Old Welland Canal

Name: **BOISE CASCADE CANADA LTD., FORT FRANCES**

History: The mill was established in 1914 as a groundwood mill. In 1971 a kraft mill was added.

Manufacturing Summary:
Kraft pulping
Pulp bleaching
Groundwood pulping
Paper making
Market pulp production

Mill Employees: 1000

Production:
600 tonne/day Groundwood pulp
500 tonne/day Bleached Kraft pulp

Saleable product:
660 tonne/day Groundwood specialty
440 tonne/day Market bleached kraft pulp.

Effluent Treatment:

Primary:

Paper mill effluent: Clarifier
Woodroom effluent: Clarifier
Final mill effluent: 2 settling lagoons

Secondary:

Final mill effluent: Aerated lagoon

Effluent Discharge: 93,000 m3/day to Rainy River

Name: **BOISE CASCADE CANADA LTD., KENORA**

History: The mill located in the town of Kenora was established in 1924. The mill operates a high yield sulphite pulping process (without recovery) and produces groundwood pulp.

Manufacturing Summary:
Groundwood pulping
Sulphite pulping
Paper making

Mill Employees: 850

Production:
575 tonne/day groundwood pulp
245 tonne/day sulphite pulp

Saleable product 700 tonne/day newsprint
100 tonne/day groundwood specialty

Effluent Treatment: Primary:

Woodroom and mill effluent: Clarifier

Effluent Discharge: 48,800 m3/day to Winnipeg River

Name: **CANADIAN PACIFIC FOREST PRODUCTS LTD, DRYDEN**

History: Located in Dryden, the company, originally Dryden Timber and Power Company, was formed in 1910. Production of kraft pulp and sheathing began in 1913. In 1979, Great lakes Forest Products Ltd. purchased the mill and undertook a major modernization and expansion program which included up-to-date pollution abatement measures. Formally known as Great Lakes Forest Products Ltd.

Manufacturing Summary: Kraft pulping
Pulp bleaching
Paper making

Mill Employees: 1030

Saleable product: 670 tonne/day bleached kraft pulp
286 tonne/day fine papers

Effluent Treatment: Primary:

Mill effluent: Clarifier and spill pond

Secondary:

Mill effluent: aerated lagoon followed by settling pond

Effluent Discharge: 84,000 m3/day to Wabigoon River.

Name: **CANADIAN PACIFIC FOREST PRODUCTS LTD., THUNDER BAY**

History: The mill is located in Thunder Bay and began operation in 1924 as a groundwood mill. A newsprint mill was constructed in 1927 and a sulphite mill was added in 1936. In 1966, a kraft mill was constructed followed by a second kraft mill in 1976. Spent sulphite liquors from the sulphite mill are recovered in the kraft mill recovery system. Formally known as Great Lakes Forest Products Ltd.

Manufacturing Summary: Kraft pulping
Pulp bleaching
Groundwood pulping
Sulphite pulping
Paper making

Mill Employees: 1033

Production: 910 tonne/day Groundwood pulp
300 tonne/day Sulphite pulp
1300 a.d. tonne/day Bleached kraft pulp

1170 tonne/day Newsprint

Effluent Treatment: Primary:

News mill effluent: 2 Clarifiers
Kraft mill effluent: 2 Clarifiers

Effluent Discharge: 222,000 m3/day to Kamanistikwia River.

Name: **DOMTAR INC., FINE PAPERS DIVISION, CORNWALL**

History: The mill was established in 1883 as a groundwood mill. In 1888 the mill added a sulphite pulping operation. A soda pulp mill was added in 1927 but was converted to a kraft mill in the 1940's. The sulphite and groundwood mills were shut down in the 1970's. The mill purchases market pulps to supplement its furnish.

Manufacturing Summary: Kraft pulping
Pulp bleaching
Paper making

Mill Employees: 1450

Production: 400 tonne/day Bleached kraft pulp

Saleable product: 200 tonne/day Paperboard
600 tonne/day Fine paper

Effluent Treatment: Primary:

Mill main effluent: Clarifier

Effluent Discharge: 102,400 m3/d to St. Lawrence River

Name: **DOMTAR INC., CONTAINERBOARD DIVISION, RED ROCK**

History: The mill was built in 1945 as a sulphite mill and was converted to a kraft mill in 1959. In 1961, the mill was purchased by Domtar Inc. The mill was expanded and renovated in 1970.

Manufacturing Summary:
Kraft pulping
Pulp bleaching
Groundwood pulping
Paper making

Mill Employees: 650

Production:
600 tonne/day Kraft pulp
150 tonne/day Groundwood pulp
50 tonne/day Semi-bleached kraft pulp

Saleable Product
600 tonne/day Linerboard
200 tonne/day Newsprint

Effluent Treatment: Primary:

Mill effluent: Clarifier and spill pond

Effluent Discharge: 91,000 m3/day to Nipigon Bay, Lake Superior

Name: **DOMTAR INC., FINE PAPERS DIVISION, ST. CATHARINES**

History: A mill was first established at this site in 1878. Today the mill no longer produces pulp but manufactures fine papers from purchased pulps and recycled clean waste paper.

Manufacturing Summary:
Repulping
Paper making

Mill Employees: 500

Saleable product: 200 tonne/day fine paper

Effluent Treatment: Primary:

Mill effluent: Clarifier

Effluent Discharge: 9,752 m3/day to Old Welland Canal

Name: **DOMTAR INC., CONTAINERBOARD DIVISION, TRENTON**

History: The mill was established in Trenton in 1926. Originally the mill produced soda pulp from cereal straws but in 1951 this process was replaced with a NSSC process for pulping wood. In the 1970's, the mill was modernized and the NSSC process was converted to caustic semi-chemical pulping which eliminated the use of sulphur. Waste pulping liquors are collected and sold for use as a dust suppressant. The mill also processes recycled waste corrugating medium and board.

Manufacturing Summary: Semi-chemical pulping
Board making

Mill Employees: 140

Production: 130 tonne/day semi-chemical pulp

Saleable product: 282 tonne/day Corrugating medium

Effluent Treatment: Recovery and reuse of spent pulping liquors.

Effluent Discharge: 3,700 m3/day to Trent River

Name: **E.B. EDDY FOREST PRODUCTS LTD., ESPANOLA**

History: The mill started operation in 1902 as a groundwood pulp mill. In 1936, the mill was closed down and did not reopen until 1946 when a new kraft mill was constructed. The groundwood mill was shut down in 1966. In the late 1970's, the mill underwent a modernization program which included the installation of an oxygen delignification process and the installation of secondary effluent treatment.

Manufacturing Summary: Kraft pulping
Pulp bleaching
Paper making

Mill Employees: 940

Saleable Product: 900 tonne/day Bleached kraft pulp
120 tonne/day Kraft specialty paper
20 tonne/day Fine papers

Effluent Treatment: Primary:

Woodroom effluent: Settling Lagoon
Paper mill effluent: 2 clarifiers

Secondary:

Final mill effluent: aerated lagoon

Effluent Discharge: 117,600 m3/day to the Spanish River.

Name: **E.B. EDDY FOREST PRODUCTS LTD., OTTAWA**

History: The mill commenced operations in 1905 producing a variety of paper and board products. In 1979, the paperboard mill was shut down and the mill currently produces fine papers. The mill is essentially integrated with the E.B. Eddy pulp mill in Hull, Quebec which lies across the Ottawa River.

Manufacturing Summary: Paper making

Mill Employees: 600

Production: 200 tonne/day Fine papers

Effluent Treatment: Primary:

Mill effluent: Clarifier

Effluent Discharge: 7,950 m3/day to Ottawa River

Name: **FRASER INC., THOROLD**

History: The mill was established in Thorold in 1903. It now manufactures fine papers from deinked recycled waste paper and purchased pulps. In the 1970's, the mill installed a high- rate biological oxidation system to treat the effluent from the deinking plant.

Manufacturing Summary:	Waste paper deinking Paper making
Mill Employees:	625
Saleable Product:	270 tonne/day Fine papers
Effluent Treatment:	Primary: Final Effluent: Clarifier Secondary: Final effluent: High-rate biological oxidation followed by Clarifier
Effluent Discharge:	25,300 m3/day to Old Welland Canal

Name: **JAMES RIVER MARATHON LIMITED, MARATHON**

History: The mill was constructed as a kraft mill in 1945. In the late 1970's, the mill embarked on a modernization program and in 1984 installed a foam retention lagoon and a diffuser outfall into Lake Superior which eliminated a long-standing aesthetic problem associated with the mill's discharge.

Manufacturing Summary:	Kraft pulping Pulp bleaching
Mill Employees:	600
Production:	440 tonne/day Bleached kraft pulp
Effluent Treatment:	Primary: Mill effluent: Clarifier Final mill effluent: Diffuser outfall
Effluent Discharge:	64,530 m3/day to Lake Superior

Name: **KIMBERLY CLARK OF CANADA LTD., HUNTSVILLE**

History: The mill was constructed in March 1971 and uses purchased bleached kraft pulp to manufacture tissue. It is the largest tissue mill in Canada.

Manufacturing Summary: Paper making (Tissue)

Mill Employees: 70

Production: 95 tonne/day Tissue

Effluent Treatment: Primary:

Mill effluent: Clarifier, polishing basins and percolating bed in winter or spray irrigation in the summer.

Effluent Discharge: 425 m3/day to Muskoka River

Name: **KIMBERLY CLARK OF CANADA LTD., ST. CATHARINES**

History: The mill dates back to 1912 when it was constructed as a groundwood mill. The mill uses purchased pulps to produce tissue, crepe paper and fine paper products.

Manufacturing Summary: Paper making

Mill Employees: 200

Production: 50 tonne/day Tissue
35 tonne/day Crepe
12 tonne/day Fine papers

Effluent Treatment: Primary:

Final mill effluent: Clarifier followed by detention basin

Effluent Discharge: 10,066 m3/day to Old Welland Canal

Name: **KIMBERLY CLARK OF CANADA LTD., TERRACE BAY**

History: The mill was constructed in 1948 as a small (320 tonne per day) kraft mill. Over the years, production was steadily increased and in 1978, a new second kraft pulping mill was added. In 1981, a fire occurred at the mill and during subsequent reconstruction, several new process changes were incorporated. The mill is presently constructing an aerated lagoon to treat the final mill effluent.

Manufacturing Summary: Kraft pulping
Pulp bleaching

Mill Employees: 1125

Production: 1200 tonne/day bleached kraft pulp

Effluent Treatment: Primary:

Mill main effluent: 2 clarifiers

Secondary:

Aerated lagoon (under construction)

Effluent Discharge: 121,120 m3/day to Moberly Bay, Lake Superior

Name: **MACMILLAN-BLOEDEL LIMITED, STURGEON FALLS DIVISION, STURGEON FALLS**

History: The mill dates back to 1900 and operated from then until 1930 when it was shut down. In 1948, the mill was reopened and began production of hardboard (Masonite) and corrugating medium using the neutral sulphite semi-chemical pulping process. Waste pulping liquors are not recovered.

Manufacturing Summary: NSSC pulping
Mechanical pulping
Paperboard formation
Hardboard sheet formation

Mill Employees: 420

Production: 200 tonne/day NSSC pulp
110 tonne/day mechanical pulp

Saleable product: 200 tonne/day corrugating medium
110 tonne/day hardboard

Effluent Treatment: Primary:

Paper mill and Hardboard mill effluent: Clarifier

Effluent Discharge: 10,760 m3/day to Sturgeon River

Name: **MALETTE KRAFT PULP AND POWER, SMOOTH ROCK FALLS**

History: The mill was originally built in 1916 as a sulphite mill and was converted to a kraft mill in 1965.

Manufacturing Summary: Kraft pulping
Pulp bleaching

Mill Employees: 300

Production: 320 tonne/day bleached kraft pulp

Effluent Treatment: Primary:

Mill effluent: Clarifier
Final mill effluent: Settling pond followed by foam retention pond

Effluent Discharge: 53,000 m3/day to Mattagami River

Name: **QUEBEC & ONTARIO PAPER COMPANY LTD., THOROLD**

History: The mill began operation at the present site in 1913 and manufactured newsprint from sulphite and groundwood pulps. In the 1980's, the mill constructed a deinking plant for recycling newsprint and in 1987 the sulphite pulping operation was shut down. A high rate biological treatment system which utilizes oxygen, was installed to treat the wastes from the deinking operations. The mill is the only mill in Canada which recycles newsprint.

Manufacturing Summary: Newsprint deinking
Thermo-mechanical pulping (TMP)
Paper making

Mill Employees: 1150

Production: 460 tonne/day Thermo-mechanical pulp
540 tonne/day deinked fibre

Saleable product: 900 tonne/day newsprint

Effluent Treatment: Primary:

Mill effluent: Clarifier

Secondary:

Final effluent: UNOX biological treatment system followed by 2 Clarifiers

Effluent Discharge: 85,000 m3/day to Old Welland Canal

Name: **SPRUCE FALLS POWER AND PAPER COMPANY, KAPUSKASING**

History: The mill dates back to 1922 and produced newsprint from groundwood and calcium-based sulphite pulps until 1964. At that time, a new magnesium-based sulphite process (Magnefite) which included chemical recovery of spent pulping liquors was installed. In 1976, a new 200 tonne/day thermo-mechanical mill (TMP) was installed and the calcium sulphite operations were subsequently shut down in 1982. In 1983 the TMP mill was expanded to 300 tonne/day.

Manufacturing Summary: Magnefite pulping
Groundwood pulping
Thermo-mechanical pulping
Paper making

Mill Employees: 1200

Production: 130 tonne/day magnefite pulp
440 tonne/day groundwood pulp
320 tonne/day thermo-mechanical pulp

Saleable product: 923 tonne/day newsprint
70 tonne/day bulking paper

Effluent Treatment: Primary:

Woodroom effluent: Clarifier
Mill effluent: Clarifier

Effluent Discharge: 87,000 m3/day to Kapuskasing River

Name: **ST. MARYS PAPER INC., SAULT STE. MARIE**

History: The mill was constructed in 1900 and produced newsprint from sulphite and groundwood pulps. The sulphite pulping operations were shut down in the early 1970's with the sulphite pulp being replaced with purchased bleached kraft pulp. The mill currently produces groundwood specialty papers.

Manufacturing Summary: Groundwood pulping
Paper making

Mill Employees: 520

Production: 220 tonne/day Groundwood pulp

Saleable product 350 tonne/day Specialty groundwood

Effluent Treatment: Primary:

Final mill effluent: Clarifier

Effluent Discharge: 15,700 m3/day to St. Mary's River

Name: **STRATHCONA PAPER COMPANY, STRATHCONA**

History: Located north of Napanee, the mill was built in 1872 and used neighboring forests as a source of wood. The mill no longer pulps wood but now uses clean recycled waste paper and board as its source of fibre.

Manufacturing Summary: Waste paper and board repulping
Paperboard formation

Mill Employees: 160

Production: 165 tonne/day box board

Effluent Treatment: Primary:

Mill effluent: 5 settling ponds

Secondary:

Mill effluent: 2 aerated lagoons

Effluent Discharge: 3,200 m3/day to Napanee River

Name: **PAPERBOARD INDUSTRIES CORPORATION, TRENT VALLEY PAPERBOARD MILLS DIVISION, TRENTON**

History: The mill is made up of two separate mills, the east and west mills. The east mill, constructed in 1880, originally used straw and rags to make paperboard but today uses recycled wastepaper and board. In 1976 the west mill was built and incorporated modern-day recycling and screening technologies into its manufacturing operations.

Manufacturing Summary: Waste paper and board repulping
Paperboard formation

Mill Employees: 279

Production: 250 tonne/day paperboard

Effluent Treatment: Primary:

Mill effluent: Clarifier

Effluent Discharge: 2,400 m3/day to the Trent River

TABLES

TO THE DEVELOPMENT DOCUMENT FOR THE PULP AND PAPER SECTOR

TABLE 1.

HISTORICAL DATA REFERENCES

PULP AND PAPER INDUSTRY

The references listed below have been used by the Ministry of the Environment, MISA office, to assist in the definitions of environmental problems associated with the pulp and paper industry and to review current technologies that might be applied in the resolution of these problems:-

1. DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES, NEW SOURCE PERFORMANCE STANDARDS AND PRETREATMENT STANDARDS FOR THE PULP, PAPER, AND PAPERBOARD AND THE BUILDERS' PAPER AND BOARD MILLS POINT SOURCE CATEGORY OCTOBER 1982

   Effluent Guidelines Division
   Office of Water
   U.S. Enviromental Protection Agency
   Washington,D.C. 20460

2. AQUATIC TOXICITY OF PULP AND PAPER MILL EFFLUENT: A REVIEW JUNE 1986

   D. McLEAY AND ASSOCIATES LIMITED
   (FOR ENVIRONMENT CANADA)

3. COOPERATIVE POLLUTION ABATEMENT RESEARCH (CPAR) PROGRAM OF THE FEDERAL GOVERNMENT AND THE CANADIAN PULP AND PAPER INDUSTRY 1970 - 1979

   ENVIRONMENT CANADA

   (Note: specific interest in proposals that dealt with treatment systems, toxicity of effluents, and effects on receiving waters)

4. WATER POLLUTION PROBLEMS OF PULP AND PAPER INDUSTRIES IN FINLAND AND SWEDEN

   COMMITTEE FOR THE GULF OF BOTHNIA REPORT OF THE SPECIAL WORKING GROUP -
   MAY 1987

   (Naturvardsverket RAPPORT 3348)

TABLE 1. (cont)

HISTORICAL DATA REFERENCES

PULP AND PAPER INDUSTRY

5. SELECT INVENTORY OF CHEMICALS USED IN WISCONSIN'S LOWER FOX RIVER BASIN -
(FOX RIVER STUDY)

J.J. SULLIVAN & J.J. DELFINO
UNIVERSITY OF WISCONSIN

6. INVENTORY OF PULP AND PAPER MILL EFFLUENT CONSTITUENTS - LAKE SUPERIOR- , APRIL, 1986

C. CHERWINSKY AND D. MURRAY
ONTARIO MINISTRY OF THE ENVIRONMENT

7. NON-CONVENTIONAL POLLUTANTS IN PULP AND PAPER MILL EFFLUENTS

ONTARIO FOREST INDUSTRIES ASSOCIATION, 1987

8. ONTARIO PULP AND PAPER MILLS EFFLUENT COMPOSITION

ONTARIO FOREST INDUSTRIES ASSOCIATION, MAY 1988.

TABLE 2

Parameters of Concern Identified in Pulp and Paper Mill Effluents

	RATIONALE FOR INCLUSION
TOTAL METALS	
Aluminum	Moderatley toxic, animal & suspect human carcinogen
Cadmium	Extremely toxic, moderately bioaccumlative
Copper	Toxic
Lead	Extremely toxic
Mercury	Extremely toxic, highly bioaccumlative
Zinc	Highly toxic
VOLATILES, HALOGENATED	
Bromodichloromethane	Mutagen
Carbon tetrachloride	Slightly toxic, animal & suspect human carcinogen
Chloroacetaldehyde	Mutagen
Chloroform	Slightly toxic, animal & suspect human carcinogen
Chlorofuranone	Mutagen
Chloropropenal	Mutagen
Dichloroacetone	Mutagen
Dichloroethane	Slightly toxic, animal carcinogen
Hexachloroacetone	Mutagen
Methylene Chloride	Mutagen
Pentachloroacetone	Mutagen
Pentachloropropene	Mutagen
Tetrachloroacetone	Mutagen
Tetrachloroethene	Mutagen
Tetrachloropropene	Mutagen
Trichloroacetone	Mutagen
Trichloroethane	Toxic, isomers 1,1,1-mutagen; 1,1,2-carcinogen
Trichloroethene	Mutagen
VOLATILES, NON-HALOGENATED	
Benzene	Moderately toxic, animal & suspect human carcinogen
Toluene	Moderately toxic, cancer promoter
Dimethyl Sulfide	USEPA parameter list
Dimethyl Disulfide	USEPA parameter list
EXTRACTABLES, BASE NEUTRALS	
Dibutyl phthalate	Human health risk
EXTRACTABLES, ACIDS (PHENOLS)	
2,4-dichlorophenol	USEPA parameter list
4,5-dichloroguaiacol	USEPA parameter list
2,4,5-trichlorophenol	USEPA parameter list
2,4,6-trichlorophenol	USEPA parameter list
3,4,5-trichloroguaiacol	USEPA parameter list
4,5,6-trichloroguaiacol	USEPA parameter list
2,3,4,6-tetrachlorophenol	High BCF
Pentachlorophenol	USEPA parameter list, high BCF
Phenol	Toxic, impair flavor of fish
2,3,4,5-Tetrachlorocatechol	High BCF
3,4,5,6-Tetrachloroguaiacol	USEPA parameter list, high BCF, high toxicity
DIOXINS AND BENZOFURANS	
RESIN AND FATTY ACIDS	
BCF Biocumulation Factor	

TABLE 3

Pre-Regulation Monitoring Open Characterization Data

COMPOUND	KRAFT	S / M	CORR	D / B / F P / T
HYDROCARBONS				
1-Methylene-4-(1-methylethenyl) cyclohexane	•			
1-Methyl-4-(1-methylethyldene) cyclohexane	•			
1-Methyl-4-(1-methylethyl)-1,4-cyclohexatriene	•			
1,4-Dimethoxy-2-methyl Toluene	•			
4-Hydroxy-3-Methoxy Benzaldehyde	•			
Dimethoxy Benzene	•			
Dimethyl Styrene	•			
Etheno Tetralin		•		
Ethyl Styrene	•	•		
Hexahydromethanoindene	•			
Hexane		•	•	
Methyl Cyclopentane	•	•		•
Methyl Methylene bicyclo octene	•			
Methyl Naphthalene	•	•		
Phenyl Cyclohexane		•		
Tetrahydro Methyl Naphthalene	•			
Tetrahydro Dimethyl Naphthalene	•			
t-Butyl Styrene	•			
Tetralin		•		
Trimethyl Indane		•		
Trimethyl Styrene	•			
Trimethyl Tetralin		•		
TERPINOIDS TYPE COMPOUNDS				
â-Terpineol	•	•		
4-(1-Methyl Ethyl)-1,5-Cyclohexadiene-1-methanol		•		
1,3,3-Trimethylbicyclo[2,2,1]Heptanol	•			
2,6,6-Trimethylbicyclo[3,1,1]heptan-3-one		•		
3,6,6-Trimethylbicyclo[3,1,1]heptan-2-one		•		
6,6-Dimethyl-2-Methylenebicyclo[3,1,1]Heptan-3-d	•	•		
6,6-Dimethylbicyclo[3,1,1]Hept-2-ene-2-Methanol	•			
Acetosyringone	•			
Borneol	•	•		
Camphor	•	•		
Carene	•			
Cineole	•	•		
D-Fenchone		•		
Fenchone	•	•		
Fenchyl Alcohol	•	•		
Homovanillic Acid	•	•		
Isoborneol	•			
Isoeugenol	•		•	•
Menthol	•			
Methyl Abietate		•		
Methyl-4-[1,5-Dimethyl-3-Oxohexyl]-1-Cyclohexene-1-Carboxylic		•		
â-Pinene	•			
ß-Pinene	•			
Pinene	•			
Syringaldehyde	•		•	
Terpinen-4-ol	•			
Trimethyl Norbornanone	•	•		
Vanillin	•	•	•	•
Vanillic Acid			•	•
Verbenone	•			

TABLE 3 (cont)

Pre-Regulation Monitoring Open Characterization Data

COMPOUND	KRAFT	S/M	CORR	D/B/FP/T
PHENOLS				
2-(2-Propenyl) Phenol			•	
2-Methoxy Phenol			•	
4-Hydroxy-3-Methoxy Benzaldehyde	•			
2,6-Dimethoxyphenol	•		•	
2,6-Dimethoxy-4-(2-Propenyl) Phenol			•	
2,6-bis-t-Butyl-4-Ethyl Phenol		•		
2,6-Dimethoxy-4-(2-Propenyl) Phenol	•			
Dimethoxy Phenol	•		•	•
Methoxy Phenol		•		
Methoxy Propyl Phenol	•			
Phenyl Phenol				•
CHLORINATED COMPOUNDS				
Chlorobenz Methanol	•			
Chlorotoluene				•
Dichloroguaiacol	•			
Tetrachlorodimethoxy Benzene	•			
Trichlorotrimethyl Benzene	•			
PHTHALATES				
Di-octyl Phthalate	•	•	•	•
Tetrachlorothiophene	•			
Trichlorodifluoroethane	•			
SULPHUR CONTAINING COMPOUNDS				
1-(3-thienyl) Ethanone	•			
3-(Methyl Thio)-1-Propene	•			
Carbon Disulphide				•
Dimethyl Sulphide	•			•
Dimethyl Disulphide	•			
Dimethyl Trisulphide	•			•
Dimethyl Tetrasulphide	•			
Methyl Thiophene		•		
Sulfonyl bis Methane	•			
Thiophene	•			
Thiophene Carboxyhyde	•			
KETONES				
1-(2,4-Dihydroxy-4-Methoxy Phenyl)-3-Phenyl-2-Propen-1-one			•	
1-(2,4-Dihydroxy Phenyl) Ethanone			•	
1-(4-Hydroxy-3-Methoxy Phenyl) Ethanone	•		•	
1-(4-Hydroxy-3,5-Dimethoxy Phenyl) Ethanone			•	•
2-Butanone	•			
2-Hydroxy cyclohexanone			•	
2-Hydroxy-3-Methyl-2-cyclopenten-1-one			•	
3-Methyl-2-Butanone	•			
4-(4-Hydroxy Phenyl)-2-Butanone			•	
4-Hydroxy-3,5-dimethoxyphenylacetophenone	•			
1,3,5-Tri-(2-Propenyl)-1,3,5-Triazine-2,4,6-(1H,2H,3H) Trione		•		
2,3,4-Trimethyl-2-Cyclopenten-1-one	•			
2,3,5-Trimethyl-2,5-cyclohexadiene-1,4-Dione			•	
3,4,5-Trimethyl-2-Cyclopenten-1-one	•			
Acetone	•	•	•	•
Acetophenone	•			•

TABLE 3 (cont)

Pre-Regulation Monitoring Open Characterization Data

COMPOUND	KRAFT	S/M	CORP	D/B/FP/T
KETONES (cont)				
Acetovanillone	•			•
Anthraquinone	•			
Benzophenone				•
Cyclohexyl Ethanone			•	
Cyclohexanone	•			
Hexane Dione			•	
Hydroxy Methyl Cyclopentenone			•	
Methyl Cyclopentenone	•			
Propanone		•		
Trimethyl Cyclopetenone			•	
ESTERS				
Butyl Ether				•
Ethyl Acetate				•
Isopropyl Acetate				•
Propyl Acetate				•
ALDEHYDES				
1,4-Dimethyl-Octahydro-1-Phenanthrene Carboxaldehyde		•		
[Hydroxy,Methoxy,Phenyl]Propanone		•		
Dimethyl Isopropyl Octahydrophenanthrene Carboxaldehyde		•		
Furan Carboxaldehyde		•		
Hexanal	•		•	
Isopropyl Dimethyl Octahydrophenanthrene Carboxaldehyde		•		
Methyl Furan Carboxaldehyde		•		
Trimethyl Ethenyl Doderahydro Phenanthrene Carboxaldehyde		•		
ALCOHOLS				
å,å,4-Trimethyl cyclohexene-1-Methanol	•			
1-(2-Butoxy Ethoxy) Ethanol	•			•
2-[2-Butoxyethoxy] Ethanol	•	•	•	•
2-[2-Butoxyethoxy] Ethanol Acetate	•	•	•	•
2-[2-(2-Butoxyethoxy) Ethoxy] Ethanol		•		•
2-[g-Octadecenyloxy] Ethanol		•		
2-Butoxy Ethanol				•
2-Ethyl-4-Methyl-1,3-Dioxolane				•
38-5-å,2,4,5-Stigmast-7-en-3-ol		•		
3-Methoxy Heptene				•
5-(Pentyloxy)-1-Pentene		•		
5-(Pentyloxy)-2-Pentene		•		
1-(1-Methyl Propoxy) Butane				•
3,3-Dimethoxy[(1,1-Biphenyl)]-4,4-Diol		•		
3,7,11-Trimethyl-1,6,10-Dodecatien-3-ol		•		
4,7,10-Trimethyl-2,5,8,11-Tetraoxatetradecan-13-ol		•		
Benzene Methanol	•		•	•
[Butoxy Ethoxy] Ethanol	•	•		
[Butoxy Ethoxy] Ethanol/Acetate		•		
Butoxy Ethanol	•			•
Dimethyl Isopropyl Octahydro Phenanthrene Methanol		•		
Ergost-5-en-3-ol		•		
Ethanol	•			
Ethenyl Decahydrotetramethyl Methylene Naphthalene Propanol	•			
Furan Methanol	•		•	
Isopropyl Methyl Cyclohexanal	•			
Methoxy Ethoxy Ethanol		•		
Octahydro Dimethyl Isopropyl Phenanthrene Methanol		•		
Tetramethyl Methylene Ethenyl Decahydro Naphthalene Propanol		•		

TABLE 3 (cont)

Pre-Regulation Monitoring Open Characterization Data

COMPOUND	KRAFT	S / M	CORR	D / B / F P / T
CARBOXYLIC ACIDS				
1,4-Dimethyl-Octahydro-1-Phenanthrene Carboxylic Acid		•		
9,12-Octadecadienoic Acid			•	
Benzoic Acid			•	
Trimethyl-7-Ethyl-Tetradecahydro-1-Phenanthrene Carboxylic Acid		•		
MISCELLANEOUS COMPOUNDS				
1-[4-Hydroxy-3-Methoxy Phenyl] Propanone		•		
2-Ethylhexyl diphenyl phosphate		•		
2-Methoxy-4-propylphenol		•		
2-Methyl-5-propylthiophene	•			
2-[2-(2-Ethoxyethoxy)ethoxy]ethanol				•
3-(4-Methoxy Phenol)-2-Propanoic Acid	•			
3-Methylfuran			•	
3-Methyl-6-(1-methylethyledene)cyclohexene	•			
4-Butoxybutanoic acid	•			
4-Ethenyl-1,4-dimethylcyclohexene	•			
4-Methylene-(1-methylethynyl)cyclohexene	•			
5-Methyl-3-(1-methylethynyl)cyclohexene	•			
5-Pentyloxy-2-Pentene		•		
1,1-[Oxybis[2,1-Ethane Diyloxy]] bis Butane				•
2,3-Dihydro-1,4-Benzodioxin			•	
2,5-Dimethylfuran			•	
3,4-Dimethyl-2,4,6-Octatriene	•			
1,1,1-Trichloroethane	•	•		•
1,3,5-Tri-2-Propenyl-1,3,5-Triazine-2,4,6-Trione		•		•
2,3,4-Trimethylcyclopentenone	•			
2,5,8,11,14-Pentaoxapentadecane		•		
Benzene Acetonitrile				•
Butoxy Butanic Acid	•			
Butyl Methoxy Benzene	•			
Cymene	•	•	•	•
Dibutyl Ether		•		
Diethylbiphenyl	•			
Dihydroxy Phenyl Ethanone	•			
Dimethyl Isopropyl Octahydro Naphthalene		•		
Ergostenol	•			
Ethyl Benzaldehyde	•			
Guaiacol	•			
Mentha-4,8-diene-2,5,5-trimethyl-1,3,6-hexatriene	•			
Methyl Cyclopentanone	•			•
Methyl Isothyocyanate		•		
Methyl Methylene Isopropyl Octahydro Naphthalene		•		
N-cyclohexyl Formamide		•		
N,N-Diethyl-3-Methyl Benzamide		•		
Octahydro-8a-methyl-2(1h)-Naphthalenone		•		
Pentamethyl-3-Ethenyl Dodecahydro Naphtho[2.1.b.] Pyran	•	•		
Phosphoric Acid Diethyl Pentyl Ester		•		
Stigmastenol		•		
Thienylethanone	•			
Tri-(2-chloroethanol) Phosphate		•		
Trimethyl Cyclopentenone		•		•

NOMENCLATURE FOR TABLE 4

All concentrations in µg/l, (ppb)

Symbol Used	Explanation of Symbol Used in MDATA column
<n<W	Result is below the Analytical Method Detection Limit, n
<n<	Result is below the Analytical Method Detection Limit, n
N.D.	Result is below the Analytical Method Detection Limit
x<SQ	Less than based on a semi-quantitative method
x<T	Result is above the Analytical Method Detection Limit, but the value is tentative only.
x	Analytical result
IAR	No numeric result
!AW	No data: analysis withdrawn
!BL	No Data, Unreliable Blank Sample
INP	No Data: No appropiate procedure available
ISS	No Data: Separate sample, Proper preservation required
NSS	No suitable sample
SPL	Several peaks, Large, not priority pollutants
SQT	Result based on semi-quantitative method
x UIN	Unreliable: indeterminate interference
X1	Diluted by 10 detection limits 10 times normal
X2	Diluted by 100 detection limits 100 times normal

Min, Max and Mean values taken from Appendix 1 of "Ontario Pulp and Paper Mills Effluent Composition"; Ontario Forest Industries Association, May, 1988

Mdata values taken from MOE sampling results, 1987

TABLE 4

Pre-Regulation Monitoring EMPPL Data

Sulphate (Kraft) Category

	Boise-Cascade, Fort Frances				Canadian-Pacific, Dryden				Canadian-Pacific, Thunder Bay				Domtar Inc., Cornwall				Domtar Inc, Red Rock			
	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA
TOTAL METALS																				
Aluminum	820	3400	1693	IBL	1900	2400	2112.5	<10<	2900	5800	4200	5800	1550	2900	2238		2700	5800	4075	3700
Beryllium				<50<				<10<				<50<								<10<
Cadmium	N.D.	1.8	0.4	<10<	0.2	1.28	0.7	<1<	0.7	2.8	1.5	<15<	0.8	1.3	1.1		0.2	0.85	0.5	<2<
Chromium	N.D.	40	1.38	<10<	40	80	58.8	<10<	110	680	370	430	N.D.	20	11.3		N.D.	10	6.3	10
Cobalt				<10<				<10<				<50<								<10<
Copper	5	28	17.6	<10<	N.D.	20	7.8	20	N.D.	30	15.6	<50<	10	20	13.8		5	15	10	10
Lead	N.D.	4	1.8	<10<	N.D.	7	2.1	<10<	N.D.	7.5	2.9	<15<	3	9	5		N.D.	4	2	<20<
Molybdenum				<50<				<10<				<50<								<10<
Nickel	N.D.	N.D.	5	<10<	N.D.	N.D.	5	<10<	N.D.	20	8.8	<50<	N.D.	10	7.5		N.D.	N.D.	5	<10<
Silver				<25<				<30<				<25<								<30<
Thallium	20	40	35	1000<sq	80	90	87.5	<500<	N.D.	40	22.5	500<sq	20	20	20		N.D.	N.D.	10	500<sq
Vanadium				<10<				<10<				<100<								<10<
Zinc	80	160	120	<10<	40	100	70	20	50	160	98.8	140	40	50	42.5		30	50	40	30
Cyanide	N.D.	N.D.	1	<1<W	N.D.	N.D.	1		N.D.	N.D.	1	<1<W	N.D.	4	1.8		N.D.	N.D.	1	<1<W
Mercury	N.D.	0.25	0.081	0.02	0.16	0.3	0.283	ISS	N.D.	0.2	0.12	0.07	N.D.	N.D.	0.025		N.D.	0.1	0.004	0.03
HYDRIDES																				
Antimony				1				1				1								250<sq
Arsenic	N.D.	1	0.6	<1<	N.D.	N.D.	0.5	<1<	N.D.	2	0.9	1	N.D.	2	0.9		N.D.	2	1.1	<1<
Selenium				5				<1<				<1<								<1<
VOLATILES, HALOGENATED																				
1,1,2,2-Tetrachloroethane				<2<W				<5<W				<10<W								<2<W
1,1,2-Trichloroethane	N.D.	N.D.	0.3	<2<W	N.D.	0.7	0.4	<5<W	N.D.	N.D.	0.3	<10<W	N.D.	N.D.	0.3		N.D.	N.D.	0.3	<2<W
1,1-Dichloroethane	N.D.	N.D.	0.1	<2<W	N.D.	N.D.	0.1	<5<W	N.D.	N.D.	0.1	<10<W	N.D.	N.D.	0.1		N.D.	N.D.	0.1	<2<W
1,1-Dichloroethylene				SPL				<5<W				<10<W								<2<W
1,2-Dichlorobenzene	N.D.	N.D.	0.2	<2<W	N.D.	2.5	0.7	<5<W	N.D.	N.D.	0.2	<10<W	N.D.	N.D.	0.2		N.D.	N.D.	0.2	<2<W
1,2-Dichloroethane (Ethylene dichloride)	N.D.	N.D.	0.1	<2<W	N.D.	3.3	0.9	<5<W	N.D.	N.D.	0.1	<10<W	N.D.	N.D.	0.1		N.D.	N.D.	0.1	<2<W
1,2-Dichloropropane	N.D.	N.D.	0.1	INP	N.D.	N.D.	0.1	INP	N.D.	N.D.	0.1	INP	N.D.	N.D.	0.1		N.D.	N.D.	0.1	INP
1,3-Dichlorobenzene	N.D.	N.D.	0.2	<2<W	N.D.	N.D.	0.2	<5<W	N.D.	N.D.	0.2	<10<W	N.D.	N.D.	0.2		N.D.	N.D.	0.2	<2<W
1,4-Dichlorobenzene	N.D.	N.D.	0.2	<2<W	N.D.	N.D.	0.2	<5<W	N.D.	2.5	0.7	<10<W	N.D.	N.D.	0.2		N.D.	N.D.	0.2	<2<W
Bromoform				<2<W				<5<W				<10<W								<2<W
Bromomethane																				
Carbon tetrachloride	N.D.	N.D.	0.5	<2<W	N.D.	N.D.	0.5	<5<W	N.D.	N.D.	0.5	<10<W	N.D.	N.D.	0.5		N.D.	N.D.	0.5	<2<W
Chlorobenzene	N.D.	N.D.	0.1	<2<W	N.D.	N.D.	0.1	<5<W	N.D.	N.D.	0.1	<10<W	N.D.	N.D.	0.1		N.D.	N.D.	0.1	<2<W
Chloroform	119	339	225.3	232X1	128	416	246.3	439X2	769	1110	955.8	2177X2	110	158	128.5		29.1	153	72.3	11<T
Chloromethane																				
Cis-1,3-Dichloropropylene																				
Dibromochloromethane	N.D.	N.D.	0.1	<2<W	N.D.	N.D.	0.1	<5<W	N.D.	N.D.	0.1	<10<W	0.3	0.5	0.3		N.D.	N.D.	0.1	<2<W
Bromodichloromethane	N.D.	N.D.	0.1	<2<W	N.D.	N.D.	0.1	<5<W	1.2	3.8	2.1	<10<W	N.D.	1.1	0.9		N.D.	N.D.	0.1	<2<W
Ethylene dibromide																				
Methylene chloride	N.D.	37.5	19.2	<2<W	N.D.	25.9	10.2	25<T	N.D.	54	17.3	12<T	N.D.	49.5	26.4		13	41.5	27	17<T
Tetrachloroethylene (Perchloroethylene)				<2<W				<5<W				<10<W								<2<W
Trans-1,2-Dichloroethylene				<2<W				<5<W				<10<W								<2<W
Trans-1,3-Dichloropropylene																				
Trichloroethylene				<2<W				<5<W				<10<W								<2<W
Trichloroethane	N.D.	N.D.	0.1		N.D.	0.4	0.2		N.D.	0.4	0.2		N.D.	N.D.	0.1					
Trichlorofluoromethane	N.D.	2.8	0.8		N.D.	N.D.	0.3	2.3	N.D.	N.D.	0.3		N.D.	N.D.	0.3					
Vinyl chloride (Chloroethylene)																				

TABLE 4 (cont)

Pre-Regulation Monitoring EMPPL Data

Sulphate (Kraft) Category

	Boise-Cascade, Fort Frances				Canadian-Pacific, Dryden				Canadian-Pacific, Thunder Bay				Domtar Inc., Cornwall				Domtar Inc, Red Rock			
	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA
VOLATILES, NON-HALOGENATED																				
Benzene	N.D.	N.D.	1	<2<W	N.D.	N.D.	1	<5<W	N.D.	N.D.	1	<10<W	N.D.	8.5	5.8		N.D.	N.D.	1	<2<W
Toluene	N.D.	34	13	<2<W	N.D.	N.D.	1.5	<5<W	N.D.	N.D.	1.5	<10<W	N.D.	N.D.	1.5		N.D.	N.D.	1.5	<2<W
o-Xylene				<2<W				<5<W				<10<W								<2<W
m-Xylene and p-Xylene				<2<W				<5<W				<10<W								<2<W
EXTRACTABLES, BASE NEUTRAL																				
Acenaphthene												<1<W								<1<W
5-nitro Acenaphthene																				
Acenaphthylene	N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5	<1<W	N.D.	4	2.3		N.D.	N.D.	0.5	2<T
Anthracene	N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5	<1<W	N.D.	1.8	0.9		N.D.	N.D.	0.5	<1<W
Benz(a)anthracene												<2<W								<2<W
Benzo(a)pyrene												<2<W								<2<W
Benzo(b)fluoranthene																				
Benzo(ghi)perylene												<2<W								<2<W
Benzo(k)fluoranthene												<5<W								<5<W
Camphene												INP								
1-Chloronaphthalene												INP								
2-Chloronaphthalene												<1<W								
Chrysene												<1<W								<1<W
Dibenz(a,h)anthracene												<4<W								<4<W
Fluoranthene	N.D.	N.D.	0.5		N.D.	3.9	1.4		N.D.	N.D.	0.5	<1<W	1.3	2	1.3		N.D.	N.D.	0.5	<1<W
Fluorene												<1<W								<1<W
Indene(1,2,3-cd)pyrene												<1<W								<1<W
Indole												INP								
1-Methylnaphthalene												<1<W								IAW
2-Methylnaphthalene												<1<W								
Naphthalene	N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5	<1<W	3.3	10.8	6.5		N.D.	N.D.	0.5	<1<W
Perylene												INP								
Phenanthrene	N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5	<1<W	5.4	8.2	7		N.D.	N.D.	0.5	<1<W
Pyrene	N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5	<1<W	N.D.	1.2	0.7		N.D.	N.D.	0.5	<1<W
Benzyl butyl phthalate	N.D.	49.1	16.1		N.D.	77.7	31.6		N.D.	11.6	3.8	<1<W	N.D.	N.D.	0.5		N.D.	N.D.	0.5	2<T
Bis(2-ethylhexyl) phthalate	7.2	110	32.6		4	148	41.3		N.D.	16.5	6	<5<W	2	5.7	3.4		2.8	314	81.1	<5<W
Di-n-butyl phthalate	4.8	231	67.9		22	248	165.8		7.7	160	49.2	<1<W	8.8	90	30.1		4.2	63	20.3	<1<W
Di-n-octyl phthalate												<2<W								<2<W
4-Bromophenyl phenyl ether												<1<W								<1<W
4-Chlorophenyl phenyl ether												<1<W								<1<W
Bis(2-chloroisopropyl)ether												<1<W								
Bis(2-chloroethyl)ether												3								IAW
Diphenyl ether												INP								
2,4-Dinitrotoluene												<1<W								<2<W
2,6-Dinitrotoluene												<1<W								<1<W
Bis(2-chloroethoxy)methane												<1<W								<1<W
Diphenylamine																				
N-Nitrosodiphenylamine												<1<W								<1<W
N-Nitrosodi-n-propylamine												<2<W								

TABLE 4 (cont)

Pre-Regulation Monitoring EMPPL Data

Sulphate (Kraft) Category

	Boise-Cascade, Fort Frances				Canadian-Pacific, Dryden				Canadian-Pacific, Thunder Bay				Domtar Inc., Cornwall				Domtar Inc, Red Rock			
	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA
EXTRACTABLES, ACID (PHENOLS)																				
2,3,4,5-Tetrachlorophenol												<1<W								<1<W
2,3,4,6-Tetrachlorophenol												<1<W								<1<W
2,3,5,6-Tetrachlorophenol												<1<W								
2,3,4-Trichlorophenol												<1<W								
2,3,5-Trichlorophenol																				
2,4,5-Trichlorophenol												<1<W								
2,4,6-Trichlorophenol	N.D.	17	6.1		N.D.	39.2	25.4		N.D.	10.5	7.7	8	N.D.	N.D.	2.5		N.D.	N.D.	2.5	3<T
2,4-Dimethyl phenol												<5<W								IAW
2,4-Dinitrophenol												INP								INP
2,4-Dichlorophenol	N.D.	4	2.8		N.D.	11.8	5.6		N.D.	4	2.8	<1<W	N.D.	N.D.	2.5		N.D.	N.D.	2.5	<1<W
2,6-Dichlorophenol												<1<W								
4,6-Dinitro-o-cresol																				INP
2-Chlorophenol												<1<W								
4-Chloro-3-methylphenol																				
4-Nitrophenol												<2<W								<2<W
m-Cresol												<1<W								
o-Cresol												<1<W								
p-Cresol												INP								
Pentachlorophenol												<1<W								<1<W
Phenol *	N.D.	2	1.3		N.D.	66.6	18		1.7	7.4	4.0	7	70.1	380	169.2		N.D.	50	25.3	27
Extractables, Neutrals																				
1,2,3,4-Tetrachlorobenzene				<.001<W				<.001<W				<.001<W								<.001<W
1,2,4,5-Tetrachlorobenzene				<.001<W				0.358				<.001<W								<.001<W
1,2,3,5-Tetrachlorobenzene				<.001<W				<.001<W				<.001<W								<.001<W
1,2,3-Trichlorobenzene				<.001<W				<.001<W				<.001<W								<.001<W
1,2,4-Trichlorobenzene				<.002<W				<.002<W				<.002<W								<.002<W
2,4,5-Trichlorotoluene				0.045				0.1				<.001<W								<.001<W
Hexachlorobenzene				0.005				<.001<W				<.001<W								<.001<W
Hexachlorobutadiene				<.001<W				<.001<W				<.001<W								<.001<W
Hexachlorocyclopentadiene																				
Hexachloroethane				<.001<W								<.001<W								<.001<W
Octachlorostyrene								NSS				NSS								NSS
Pentachlorobenzene				<.001<W				0.148				<.001<W								<.001<W

TABLE 4 (cont)

Pre-Regulation Monitoring EMPPL Data

Sulphate (Kraft) Category

	E.B. Eddy, Espanola				James River, Marathon				Kimberly Clark, Terrace Bay				Malette, Smooth Rock Falls			
TOTAL METALS	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA
Aluminum	800	880	842.5	820	310	600	482.5	<1000<	400	1130	707.5	<1000<	2800	5500	4250	4100
Beryllium				<10<				<50<				<50<				<50<
Cadmium	0.8	1.3	1.1	<1<	0.4	1.8	0.9	<10<	0.9	1.2	1.1	<10<	0.9	1.8	1.4	<15<
Chromium	N.D.	10	7.5	10	N.D.	N.D.	5	<100<	N.D.	80	30	<100<	N.D.	40	15	50
Cobalt				10				<100<				<100<				<50<
Copper	N.D.	20	8.1	<10<	N.D.	15	7.5	<100<	N.D.	20	11.3	<100<	N.D.	20	10.8	<50<
Lead	1	4	2	20	1	4	2.8	<100<	N.D.	5.5	2.8	<100<	N.D.	5	2.5	<150<
Molybdenum				<10<				<50<				<50<				<50<
Nickel	N.D.	40	20	<20<	N.D.	N.D.	5	<100<	N.D.	N.D.	0.5	<100<	N.D.	N.D.	5	<50<
Silver				<30>				<250<				<250<				<250>
Thallium	N.D.	20	15	600<sq	N.D.	N.D.	5	<5000<	N.D.	30	15	<5000<	N.D.	20	12.5	500<sq
Vanadium				<100<				<100<				<100<				<50<
Zinc	60	90	75	40	60	220	110	<100<	65	190	126.3	110	80	180	132.5	200
Cyanide	N.D.	N.D.	0.1	<1<W	N.D.	N.D.	1	<5<W	N.D.	4	1.8	8	N.D.	N.D.	1	5<T
Mercury	N.D.	N.D.	0.025	<.01<	N.D.	0.05	0.031	ISS	N.D.	0.1	0.04	ISS	N.D.	0.2	0.089	50
HYDRIDES																
Antimony				4				<1<				<1<				2
Arsenic	N.D.	N.D.	0.5	1	N.D.	2.5	1	<1<	N.D.	2	0.9	<1<	N.D.	2	0.9	2
Selenium				1				<1<				<1<				1
VOLATILES, HALOGENATED																
1,1,2,2-Tetrachloroethane				<10<W				<2<W				<2<W				<10<W
1,1,2-Trichloroethane	N.D.	N.D.	0.3	<10<W	N.D.	N.D.	0.3	<2<W	N.D.	N.D.	0.3	<2<W	N.D.	N.D.	0.3	<10<W
1,1-Dichloroethane	N.D.	N.D.	0.1	<10<W	N.D.	N.D.	0.1	<2<W	N.D.	N.D.	0.1	<2<W	N.D.	N.D.	0.1	<10<W
1,1-Dichloroethylene				<10<W				SPL				SPL				<10<W
1,2-Dichlorobenzene	N.D.	N.D.	0.2	<10<W	N.D.	N.D.	0.2	<2<W	N.D.	N.D.	0.2	<2<W	N.D.	N.D.	0.2	<10<W
1,2-Dichloroethane (Ethylene dichloride)	N.D.	N.D.	0.1	<10<W	N.D.	N.D.	0.1	<2<W	N.D.	N.D.	0.1	<2<W	N.D.	N.D.	0.1	<10<W
1,2-Dichloropropane	N.D.	N.D.	0.1	INP	N.D.	N.D.	0.1	INP	N.D.	N.D.	0.1	INP	N.D.	0.6	0.3	INP
1,3-Dichlorobenzene	N.D.	N.D.	0.2	<10<W	N.D.	N.D.	0.2	<2<W	N.D.	N.D.	0.2	<2<W	N.D.	N.D.	0.2	<10<W
1,4-Dichlorobenzene	N.D.	N.D.	0.2	<10<W	N.D.	N.D.	0.2	<2<W	N.D.	N.D.	0.2	<2<W	N.D.	0.7	0.3	<10<W
Bromoform				<10<W				<2<W				<2<W				<10<W
Bromomethane																
Carbon tetrachloride	N.D.	N.D.	0.5	<10<W	N.D.	N.D.	0.5	<2<W	N.D.	N.D.	0.5	<2<W	1	2.4	1.7	<10<W
Chlorobenzene	N.D.	N.D.	0.1	<10<W	N.D.	N.D.	0.1	<2<W	N.D.	N.D.	0.1	<2<W	N.D.	N.D.	0.1	<10<W
Chloroform	30	50	38.8	22<T	598	1400	1086	659X2	436	688	539.8	931X2	456	797	586.3	1630.X2
Chloromethane																
Cis-1,3-Dichloropropylene																
Dibromochloromethane	N.D.	N.D.	0.1	<10<W	N.D.	N.D.	0.1	<2<W	N.D.	N.D.	0.1	<2<W	N.D.	N.D.	0.1	<10<W
Bromodichloromethane	0.3	0.9	0.4	<10<W	N.D.	3.4	1.6	<2<W	N.D.	0.8	0.4	<2<W	N.D.	1	0.5	<10<W
Ethylene dibromide																
Methylene chloride	N.D.	51.6	27.4	21<T	N.D.	30.1	14.1	4<T	N.D.	44.7	14.9	4<T	N.D.	37.4	13.1	20<T
Tetrachloroethylene (Perchloroethylene)				<10<W				<2<W				<2<W				<10<W
Trans-1,2-Dichloroethylene				<10<W				<2<W								
Trans-1,3-Dichloropropylene																
Trichloroethylene				<10<W				<2<W				<2<W				<10<W
Trichloroethene	N.D.	N.D.	0.1		N.D.	0.9	0.5		N.D.	N.D.	0.1		N.D.	0.8	0.4	
Trichlorofluoromethane	N.D.	N.D.	0.3		N.D.	N.D.	0.3		N.D.	N.D.	0.3		N.D.	0.5	0.3	
Vinyl chloride (Chloroethylene)																

TABLE 4 (cont)

Pre-Regulation Monitoring EMPPL Data

Sulphate (Kraft) Category

	E.B. Eddy, Espanola				James River, Marathon				Kimberly Clark, Terrace Bay				Malette, Smooth Rock Falls			
	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA
VOLATILES, NON-HALOGENATED																
Benzene	N.D.	N.D.	1	<10<W	N.D.	N.D.	1	<2<W	N.D.	4.3	1.8	2<T	N.D.	N.D.	1	<10<W
Toluene	N.D.	N.D.	1.5	<10<W	N.D.	N.D.	1.5	<2<W	N.D.	9.1	5.8	<2<W	N.D.	3.9	2.1	<10<W
o-Xylene				<10<W				<2<W				<2<W				<10<W
m-Xylene and p-Xylene				<10<W				<2<W				<2<W				<10<W
EXTRACTABLES, BASE NEUTRAL																
Acenaphthene				<1<W												<1<W
5-nitro Acenaphthene																
Acenaphthylene	N.D.	N.D.	0.5	<1<W	N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5	<1<W
Anthracene	N.D.	N.D.	0.5	<1<W	N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5	<1<W
Benz(a)anthracene				<2<W												<2<W
Benzo(a)pyrene				[illegible]												<2<W
Benzo(b)fluoranthene				<5<W												
Benzo(ghi)perylene				<2<W												<2<W
Benzo(k)fluoranthene				<5<W												
Camphene				INP												
1-Chloronaphthalene																
2-Chloronaphthalene				<1<W												
Chrysene				<1<W												
Dibenz(a,h)anthracene				<4<W												
Fluoranthene	N.D.	N.D.	0.5	<1<W	N.D.	N.D.	0.5		N.D.	3.7	1.6		N.D.	N.D.	0.5	<1<W
Fluorene				<1<W												<1<W
Indeno(1,2,3-cd)pyrene				<1<W												<1<W
Indole																
1-Methylnaphthalene				<1<W												
2-Methylnaphthalene				<1<W												
Naphthalene	N.D.	N.D.	0.5	<1<W	N.D.	N.D.	0.5		N.D.	7.2	2.8		N.D.	N.D.	0.5	<1<W
Perylene																
Phenanthrene	N.D.	N.D.	0.5	<1<W	N.D.	N.D.	0.5		N.D.	9.1	3.5		N.D.	N.D.	0.5	<1<W
Pyrene	N.D.	N.D.	0.5	<1<W	N.D.	N.D.	0.5		N.D.	2.4	1		N.D.	N.D.	0.5	<1<W
Benzyl butyl phthalate	N.D.	1.4	0.8	<1<W	N.D.	1.7	0.8		N.D.	60	15.4		N.D.	46.6	12.4	<1<W
Bis(2-ethylhexyl) phthalate	N.D.	6.8	4.8	<5<W	3.3	873	222.2		N.D.	68	20.4		N.D.	6.4	3.2	<5<W
Di-n-butyl phthalate	10.8	132	43.4	<1<W	6.8	120	72.4		4.9	260	71.9		10	248	76.3	<1<W
Di-n-octyl phthalate				<2<W												<2<W
4-Bromophenyl phenyl ether				<1<W												<1<W
4-Chlorophenyl phenyl ether				<1<W												<1<W
Bis(2-chloroisopropyl)ether				<1<W												<1<W
Bis(2-chloroethyl)ether				<3<W												
Diphenyl ether				INP												
2,4-Dinitrotoluene				<1<W												<1<W
2,6-Dinitrotoluene				<1<W												<1<W
Bis(2-chloroethoxy)methane				<1<W												
Diphenylamine																
N-Nitrosodiphenylamine				<1<W												<1<W
N-Nitrosodi-n-propylamine				<2<W												

TABLE 4 (cont)

Pre-Regulation Monitoring EMPPL Data

Sulphate (Kraft) Category

	E.B. Eddy, Espanola				James River, Marathon				Kimberly Clark, Terrace Bay				Malette, Smooth Rock Falls			
	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA
EXTRACTABLES, ACID (PHENOLS)																
2,3,4,6-Tetrachlorophenol				<1<W												<1<W
2,3,4,5-Tetrachlorophenol				<1<W												<1<W
2,3,5,6-Tetrachlorophenol				<1<W												<1<W
2,3,4-Trichlorophenol				<1<W												<1<W
2,3,5-Trichlorophenol																
2,4,5-Trichlorophenol				<1<W												<1<W
2,4,6-Trichlorophenol	N.D.	N.D.	2.5	<4<T	N.D.	15.6	11.3		N.D.	12.1	7.5		N.D.	8.1	3.9	4<T
2,4-Dimethyl phenol				<5<W												<5<W
2,4-Dinitrophenol				INP												INP
2,4-Dichlorophenol	N.D.	N.D.	2.8	<1<W	N.D.	6.1	4.1		N.D.	N.D.	2.5		N.D.	5.9	3.4	3
2,6-Dichlorophenol				<1<W												
4,6-Dinitro-o-cresol				INP												INP
2-Chlorophenol				<1<W												<1<W
4-Chloro-3-methylphenol																
4-Nitrophenol				<2<W												<2<W
m-Cresol				<1<W												
o-Cresol				<1<W												
p-Cresol				INP												
Pentachlorophenol				<1<W												<1<W
Phenol	N.D.	N.D.	1	<1<W	20	3710	947		28.7	59.8	44.1		13.5	79.5	36.3	69
Extractables, Neutrals																
1,2,3,4-Tetrachlorobenzene				<.001<W				<.001<W				<.001<W				<.001<W
1,2,4,5-Tetrachlorobenzene				<.001<W				<.001<W				<.001<W				<.001<W
1,2,3,5-Tetrachlorobenzene				<.001<W				<.001<W				<.001<W				<.001<W
1,2,3-Trichlorobenzene				<.001<W				<.001<W				<.001<W				<.001<W
1,2,4-Trichlorobenzene				<.002<W				<.002<W				<.002<W				<.002<W
2,4,5-Trichlorotoluene				<.001<W				<.001<W				<.001<W				<.001<W
Hexachlorobenzene				<.001<W				<.001<W				<.001<W				<.001<W
Hexachlorobutadiene				<.001<W				<.001<W				<.001<W				<.001<W
Hexachlorocyclopentadiene																
Hexachloroethane				<.001<W				<.001<W				<.001<W				<.001<W
Octachlorostyrene				NSB				NSB				<.001<W				NSB
Pentachlorobenzene				<.001<W				<.001<W				<.001<W				<.001<W

TABLE 4 (cont)

Pre-Regulation Monitoring EMPPL Data

Sulphite/Mechanical Category

	Abitibi-Price, Fort Williams				Abitibi-Price, Iroquois Falls				Abitibi-Price, Provincial				Abitibi-Price, Thunder Bay			
	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA
TOTAL METALS																
Aluminum	480	10800	3970	3300	4500	6000	4875	IBL	480	1020	680	510	1000	1640	1250	920
Beryllium				<10<				<50<				<10<				<10<
Cadmium	0.4	0.8	0.7	<2<	0.5	0.95	0.7	<10<	N.D.	0.7	0.4	<2<	0.2	0.9	0.7	<2<
Chromium	N.D.	20	10	30	N.D.	20	11.3	<100<	N.D.	10	6.3	<10<	N.D.	N.D.	5	10
Cobalt				10				<100<				<10<				<10<
Copper	10	20	14.4	20	20	23	20.8	<100<	N.D.	10	5	<10<	10	40	17.5	10
Lead	1	12	4.5	<20<	N.D.	9	4.4	<100<	N.D.	1	0.6	<20<	N.D.	3	2.1	<20<
Molybdenum				<10<				<50<				<10<				<10<
Nickel	N.D.	N.D.	5	10	N.D.	N.D.	5	<100<	N.D.	N.D.	5	<10<	N.D.	N.D.	5	10
Silver				<30<				<250<				<30<				<30<
Thallium	N.D.	N.D.	10	500<SQ	N.D.	N.D.	10	<500<	N.D.	N.D.	10	500<SQ	N.D.	N.D.	10	500<SQ
Vanadium				10				<100<				<10<				<10<
Zinc	30	75	60	50	100	140	122.5	210	40	80	60	30	60	100	80	60
Cyanide	N.D.	N.D.	1	<1<W	N.D.	N.D.	1	<1<W	N.D.	N.D.	1	<1<W	N.D.	N.D.	1	<1<W
Mercury	N.D.	0.1	0.04	<.01<	N.D.	N.D.	0.025	0.02	N.D.	N.D.	0.025	0.01	N.D.	N.D.	0.025	0.02
HYDRIDES																
Antimony				<1<				6				<1<				2
Arsenic	N.D.	N.D.	0.5	<1<	N.D.	2	1.3	2	N.D.	N.D.	0.5	<1<	N.D.	N.D.	0.5	<1<
Selenium				<1<				<1<W				<1<				<1<
VOLATILES, HALOGENATED																
1,1,2,2-Tetrachloroethane				<1<W				<5<W				<1<W				<5<W
1,1,2-Trichloroethane	N.D.	N.D.	0.3	<1<W	N.D.	N.D.	0.3	<5<W	N.D.	N.D.	0.3	<1<W	N.D.	N.D.	0.3	<5<W
1,1-Dichloroethane	N.D.	N.D.	0.1	<1<W	N.D.	N.D.	0.1	<5<W	N.D.	N.D.	0.1	<1<W	N.D.	N.D.	0.1	<5<W
1,1-Dichloroethylene				<1<W				<5<W				<1<W				<5<W
1,2-Dichlorobenzene	N.D.	N.D.	0.2	<1<W	N.D.	N.D.	0.2	<5<W	N.D.	N.D.	0.2	<1<W	N.D.	N.D.	0.2	<5<W
1,2-Dichloroethane (Ethylene dichloride)	N.D.	N.D.	0.1	<1<W	N.D.	N.D.	0.1	<5<W	N.D.	N.D.	0.1	<1<W	N.D.	N.D.	0.1	<5<W
1,2-Dichloropropane	N.D.	N.D.	0.1	INP	N.D.	N.D.	0.1	INP	N.D.	N.D.	0.1	INP	N.D.	N.D.	0.1	INP
1,3-Dichlorobenzene	N.D.	N.D.	0.2	<1<W	N.D.	N.D.	0.2	<5<W	N.D.	2.4	0.8	<1<W	N.D.	2.4	0.8	<5<W
1,4-Dichlorobenzene	N.D.	N.D.	0.2	<1<W	N.D.	N.D.	0.2	<5<W	N.D.	N.D.	0.2	<1<W	N.D.	N.D.	0.2	<5<W
Bromoform				<1<W				<5<W				<1<W				<5<W
Bromomethane																
Carbon tetrachloride	N.D.	N.D.	0.5	<1<W	N.D.	N.D.	0.5	<5<W	N.D.	N.D.	0.5	<1<W	N.D.	N.D.	0.5	<5<W
Chlorobenzene	N.D.	N.D.	0.1	<1<W	N.D.	N.D.	0.1	<5<W	N.D.	N.D.	0.1	<1<W	N.D.	N.D.	0.1	<5<W
Chloroform	28	83	52.8	82X1	15	23	19.5	26<T	1.7	5.7	3.5	6<T	3.3	7.2	5	7<T
Chloromethane																
Cis-1,3-Dichloropropylene																
Dibromochloromethane	N.D.	N.D.	0.1	<1<W	N.D.	N.D.	0.1		N.D.	N.D.	0.1	<1<W	N.D.	N.D.	0.1	<5<W
Bromodichloromethane	N.D.	0.4	0.2	<1<W	N.D.	0.3	0.2	<5<W	N.D.	0.4	0.2	<1<W	N.D.	0.4	0.2	<5<W
Ethylene dibromide																
Methylene chloride	N.D.	28	15	5<T	N.D.	21.9	9.2	22<T	N.D.	39.7	18	5<T	N.D.	N.D.	5	21<T
Tetrachloroethylene (Perchloroethylene)								<5<W				<1<W				<5<W
Trans-1,2-Dichloroethylene				<1<W				<5<W				<1<W				<5<W
Trans-1,3-Dichloropropylene																
Trichloroethylene				<1<W				<5<W				<1<W				<5<W
Trichloroethene	N.D.	N.D.	0.1		N.D.	N.D.	0.1		N.D.	N.D.	0.1		N.D.	N.D.	0.1	
Trichlorofluoromethane	N.D.	2.4	0.8		N.D.	N.D.	0.3		N.D.	N.D.	0.3		N.D.	N.D.	0.3	
Vinyl chloride (Chloroethylene)																

TABLE 4 (cont)

Pre-Regulation Monitoring EMPPL Data

Sulphite/Mechanical Category

	Abitibi-Price, Fort Williams				Abitibi-Price, Iroquois Falls				Abitibi-Price, Provincial				Abitibi-Price, Thunder Bay			
	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA
VOLATILES, NON-HALOGENATED																
Benzene	N.D.	N.D.	1	<1<W	N.D.	N.D.	1	<5<W	N.D.	N.D.	1	<1<W	N.D.	N.D.	1	<5<W
Toluene	8.1	83	28	43.X1	N.D.	0.8	1.3	<5<W	N.D.	8.1	1.5	<1<W	N.D	N.D	1.5	<5<W
o-Xylene				<1<W				<5<W				<1<W				<5<W
m-Xylene and p-Xylene				<1<W				<5<W				<1<W				<5<W
EXTRACTABLES, BASE NEUTRAL																
Acenaphthene				<1<W								<1<W				
5-nitro Acenaphthene																
Acenaphthylene	N.D.	N.D.	0.5	<1<W	N.D.	N.D.	0.5		N.D.	N.D.	0.5	<1<W	N.D.	N.D.	0.5	<1<W
Anthracene	N.D.	N.D.	0.5	2 UN	N.D.	N.D.	0.5		N.D.	N.D.	0.5	<1<W	N.D.	N.D.	0.5	<1<W
Benz(a)anthracene				<2<W								<2<W				<2<W
Benzo(a)pyrene				<2<W								<2<W				<2<W
Benzo(b)fluoranthene																
Benzo(ghi)perylene				<2<W								<2<W				<2<W
Benzo(k)fluoranthene				<5<W								<5<W				<5<W
Camphene																
1-Chloronaphthalene																
2-Chloronaphthalene																
Chrysene				<1<W								<1<W				<1<W
Dibenz(a,h)anthracene				<4<W								<4<W				<4<W
Fluoranthene	N.D.	N.D.	0.5	<1<W	N.D.	N.D.	0.5		N.D.	N.D.	0.5	<1<W	N.D.	N.D.	0.5	<1<W
Fluorene				<1<W								<1<W				<1<W
Indeno(1,2,3-cd)pyrene				<1<W								<1<W				<1<W
Indole																
1-Methylnaphthalene				IAW								<1<W				IAW
2-Methylnaphthalene																
Naphthalene	N.D.	N.D.	0.5	<1<W	N.D.	N.D.	0.5		N.D.	N.D.	0.5	<1<W	N.D.	N.D.	0.5	<1<W
Perylene																
Phenanthrene	N.D.	N.D.	0.5	<1<W	N.D.	N.D.	0.5		N.D.	N.D.	0.5	<1<W	N.D.	N.D.	0.5	<1<W
Pyrene	N.D.	N.D.	0.5	<1<W	N.D.	N.D.	0.5		N.D.	N.D.	0.5	<1<W	N.D.	N.D.	0.5	<1<W
Benzyl butyl phthalate	N.D.	3.7	1.3	<1<W	N.D.	84.0	16.6		N.D.	83.6	17.3	<1<W	N.D.	30.9	16.6	<1<W
Bis(2-ethylhexyl) phthalate	1.8	9.3	5.2	<5<W	N.D.	8.6	3.7		N.D.	76.7	22.5	<5<W	3.7	21	14.6	<5<W
Di-n-butyl phthalate	14.3	180	92.9	<1<W	2.2	120	40.3		3.3	223	108.9	<1<W	2.9	299	124.1	<1<W
Di-n-octyl phthalate				<2<W								<2<W				<2<W
4-Bromophenyl phenyl ether				<1<W								<1<W				<1<W
4-Chlorophenyl phenyl ether				<1<W								<1<W				<1<W
Bis(2-chloroisopropyl)ether				<1<W								<1<W				<1<W
Bis(2-chloroethyl)ether																
Diphenyl ether																
2,4-Dinitrotoluene				<2<W								<2<W				
2,6-Dinitrotoluene				<1<W								<1<W				<1<W
Bis(2-chloroethoxy)methane				<1<W								<1<W				<1<W
Diphenylamine																
N-Nitrosodiphenylamine				<1<W								<1<W				<1<W
N-Nitrosodi-n-propylamine																

TABLE 4 (cont)

Pre-Regulation Monitoring EMPPL Data

Sulphite/Mechanical Category

	Abitibi-Price, Fort Williams				Abitibi-Price, Iroquois Falls				Abitibi-Price, Provincial				Abitibi-Price, Thunder Bay			
	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA
EXTRACTABLES, ACID (PHENOLS)																
2,3,4,5-Tetrachlorophenol				<1<W								<1<W				<1<W
2,3,4,6-Tetrachlorophenol				<1<W								<1<W				<1<W
2,3,5,6-Tetrachlorophenol																
2,3,4-Trichlorophenol																
2,3,5-Trichlorophenol																
2,4,5-Trichlorophenol																
2,4,6-Trichlorophenol	N.D.	N.D.	2.5	<1<W	N.D.	N.D.	2.5		N.D.	N.D.	2.5	<1<W	N.D.	N.D.	2.5	<1<W
2,4-Dimethyl phenol				IAW								IAW				IAW
2,4-Dinitrophenol				INP								INP				INP
2,4-Dichlorophenol	N.D.	N.D.	2.5	<1<W	N.D.	N.D.	2.5		N.D.	N.D.	2.5	<1<W	N.D.	N.D.	2.5	<1<W
2,6-Dichlorophenol																
4,6-Dinitro-o-cresol				INP								INP				INP
2-Chlorophenol																
4-Chloro-3-methylphenol																
4-Nitrophenol				<2<W								<2<W				<2<W
m-Cresol																
o-Cresol																
p-Cresol																
Pentachlorophenol				<1<W								<1<W				<1<W
Phenol	18.7	47.8	21.7	940IAR	N.D.	3.6	2.3		N.D.	N.D.	1	2<T	N.D.	12	4.2	6
Extractables, Neutrals																
1,2,3,4-Tetrachlorobenzene				<.001<W				<.001<W				<.001<W				<.001<W
1,2,4,5-Tetrachlorobenzene				<.001<W				<.001<W				<.001<W				<.001<W
1,2,3,5-Tetrachlorobenzene				0.04				<.001<W				<.001<W				<.001<W
1,2,3-Trichlorobenzene				<.001<W				<.001<W				<.001<W				<.001<W
1,2,4-Trichlorobenzene				<.002<W				<.002<W				<.002<W				<.002<W
2,4,5-Trichlorotoluene				0.145				<.001<W				<.001<W				<.001<W
Hexachlorobenzene				<.001<W				<.001<W				<.001<W				<.001<W
Hexachlorobutadiene				<.001<W				<.001<W				<.001<W				<.001<W
Hexachlorocyclopentadiene																
Hexachloroethane				<.001<W				<.001<W				<.001<W				<.001<W
Octachlorostyrene				NSB				NSB				NSB				NSB
Pentachlorobenzene				<.001<W				<.001<W				<.001<W				<.001<W

TABLE 4 (cont)

Pre-Regulation Monitoring EMPPL Data

Sulphite/Mechanical Category

	Boise Cascade, Kenora				Quebec & Ontario Paper				Spruce Falls Paper				St. Marys Paper			
	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA
TOTAL METALS																
Aluminum	380	800	570	60	460	1050	745		380	2600	1600	IBL	440	6600	2243	5000
Beryllium				<10<								<50<				<50<
Cadmium	0.2	0.6	0.4	<5<	0.4	0.9	0.6		0.2	0.9	0.6	<10<	0.5	0.9	0.6	<15<
Chromium	N.D.	N.D.	5	<10<	N.D.	25	13.6		N.D.	10	6.3	<100<	N.D.	N.D.	5	<50<
Cobalt				<10<								<100<				<50<
Copper	75	90	83.6	<10<	37	55	46.5		10	20	15	<100<	10	15	12	<50<
Lead	1	6	3.9	<20<	N.D.	3	1.9		N.D.	13	4.4	<100<	1	15	6.5	<150<
Molybdenum				<10<								<50<				<50<
Nickel	N.D.	N.D.	5	<10<	N.D.	10	6.3		N.D.	N.D.	5	<100<	N.D.	N.D.	5	<50<
Silver				<30<								<250<				<250<
Thallium	N.D.	N.D.	10	<500<	N.D.	25	16.3		N.D.	N.D.	10	<500<	N.D.	N.D.	10	500<SO
Vanadium				<10<								<100<				<50<
Zinc	40	60	47.5	<10<	70	160	117.5		120	150	132.5	120	40	60	42.5	<100<
Cyanide	N.D.	N.D.	1	<1<W	N.D.	9	3.6		N.D.	N.D.	1	<1<W	N.D.	2	1.3	7
Mercury	N.D.	0.36	0.2	<.01<	N.D.	N.D.	0.025		N.D.	N.D.	0.025	0.02	N.D.	N.D.	0.025	0.02
HYDRIDES																
Antimony				5								1				10
Arsenic	N.D.	N.D.	0.5	<1<	N.D.	2	0.9		N.D.	1	0.6	<1<	N.D.	1.5	0.9	1
Selenium				5								<1<				1
VOLATILES, HALOGENATED																
1,1,2,2-Tetrachloroethane				<1<W								<1<W				<1<W
1,1,2-Trichloroethane	N.D.	N.D.	0.3	<1<W	N.D.	N.D.	0.3		N.D.	N.D.	0.3	<1<W	N.D.	N.D.	0.3	<1<W
1,1-Dichloroethane	N.D.	N.D.	0.1	<1<W	N.D.	N.D.	0.1		N.D.	N.D.	0.1	<1<W	N.D.	N.D.	0.1	<1<W
1,1-Dichloroethylene				<1<W								SPL				SPL
1,2-Dichlorobenzene	N.D.	N.D.	0.2	<1<W	N.D.	4	1.1		N.D.	N.D.	0.2	<1<W	N.D.	N.D.	0.2	<1<W
1,2-Dichloroethane (Ethylene dichloride)	N.D.	N.D.	0.1	<1<W	N.D.	N.D.	0.1		N.D.	N.D.	0.1	<1<W	N.D.	N.D.	0.1	<1<W
1,2-Dichloropropane	N.D.	N.D.	0.1	INP	N.D.	N.D.	0.1		N.D.	N.D.	0.1	INP	N.D.	N.D.	0.1	INP
1,3-Dichlorobenzene	N.D.	N.D.	0.2	<1<W	N.D.	N.D.	0.2		N.D.	N.D.	0.2	<1<W	N.D.	N.D.	0.2	<1<W
1,4-Dichlorobenzene	N.D.	N.D.	0.2	<1<W	N.D.	6.1	1.6		N.D.	N.D.	0.2	<1<W	N.D.	N.D.	0.2	<1<W
Bromoform				<1<W								<1<W				<1<W
Bromomethane																
Carbon tetrachloride	N.D.	N.D.	0.6	<1<W	N.D.	N.D.	0.6		N.D.	N.D.	0.6	<1<W	N.D.	N.D.	0.6	<1<W
Chlorobenzene	N.D.	N.D.	0.1	<1<W	N.D.	N.D.	0.1		N.D.	N.D.	0.1	<1<W	N.D.	N.D.	0.1	<1<W
Chloroform	0.9	16.7	11.9	14	N.D.	0.4	0.3		1.4	3.9	2.7	1<T	0.9	3.1	2.3	3<T
Chloromethane																
Cis-1,3-Dichloropropylene																
Dibromochloromethane	N.D.	N.D.	0.1	<1<W	N.D.	N.D.	0.1		N.D.	N.D.	0.1	<1<W	N.D.	N.D.	0.1	<1<W
Bromodichloromethane	N.D.	0.3	0.2	<1<W	N.D.	N.D.	0.1		N.D.	N.D.	0.1	<1<W	N.D.	N.D.	0.1	AIP
Ethylene dibromide																
Methylene chloride	N.D.	21.6	9.2	5<T	N.D.	19.6	11.6		N.D.	79.1	29.4	4<T	N.D.	46.3	19.1	<1<W
Tetrachloroethylene (Perchloroethylene)				<1<W								<1<W				
Trans-1,2-Dichloroethylene				<1<W								<1<W				<1<W
Trans-1,3-Dichloropropylene																
Trichloroethylene				<1<W								<1<W				AIP
Trichloroethane	N.D.	N.D.	0.1		N.D.	N.D.	0.1		N.D.	N.D.	0.1		N.D.	N.D.	0.1	
Trichlorofluoromethane	N.D.	1.6	0.6		N.D.	0.9	0.4		N.D.	2.5	0.8		N.D.	N.D.	0.3	
Vinyl chloride (Chloroethylene)																

TABLE 4 (cont)

Pre-Regulation Monitoring EMPPL Data

Sulphite/Mechanical Category

	Boise Cascade, Ianore				Quebec & Ontario Paper				Spruce Falls Paper				St. Marys Paper			
	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA
VOLATILES, NON-HALOGENATED																
Benzene	N.D.	N.D.	1	<1<W	N.D.	2.7	1.4		N.D.	N.D.	1	<1<W	N.D.	N.D.	1	<1<W
Toluene	N.D.	11.2	3.9	<1<W	316	1720	898.3		N.D.	3.1	1.9	<1<W	6.1	12.7	9	9<T
o-Xylene				<1<W								<1<W				<1<W
m-Xylene and p-Xylene				<1<W								1<T				<1<W
EXTRACTABLES, BASE NEUTRAL																
Acenaphthene																<1<W
5-nitro Acenaphthene																INP
Acenaphthylene	N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5	<1<W
Anthracene	N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5	<1<W
Benz(a)anthracene																<2<W
Benzo(a)pyrene																<2<W
Benzo(b)fluoranthene																<5<W
Benzo(ghi)perylene																<2<W
Benzo(k)fluoranthene																<5<W
Camphene																INP
1-Chloronaphthalene																INP
2-Chloronaphthalene																<1<W
Chrysene																<1<W
Dibenz(a,h)anthracene																<4<W
Fluoranthene	N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5	<1<W
Fluorene																<1<W
Indeno(1,2,3-cd)pyrene																<1<W
Indole																INP
1-Methylnaphthalene																<1<W
2-Methylnaphthalene																<1<W
Naphthalene	N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	2	1	<1<W
Perylene																INP
Phenanthrene	N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5	<1<W
Pyrene	N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5	<1<W
Benzyl butyl phthalate	N.D.	N.D.	0.5		N.D.	7.9	2.4		N.D.	N.D.	0.5		N.D.	N.D.	0.5	<1<W
Bis(2-ethylhexyl) phthalate	2.4	37.6	19.8		N.D.	8	5		1.7	11.9	5.2		N.D.	10	5.2	<5<W
Di-n-butyl phthalate	4.6	160	70.1		10	141	44.2		4.9	134	48.2		12.6	393	109.2	<1<W
Di-n-octyl phthalate																<2<W
4-Bromophenyl phenyl ether																<1<W
4-Chlorophenyl phenyl ether																<1<W
Bis(2-chloroisopropyl)ether																<1<W
Bis(2-chloroethyl)ether																7
Diphenyl ether																INP
2,4-Dinitrotoluene																<1<W
2,6-Dinitrotoluene																<1<W
Bis(2-chloroethoxy)methane																<1<W
Diphenylamine																
N-Nitrosodiphenylamine																<1<W
N-Nitrosodi-n-propylamine																<2<W

TABLE 4 (cont)

Pre-Regulation Monitoring EMPPL Data

Sulphite/Mechanical Category

	Boise Cascade, Kenora				Quebec & Ontario Paper				Spruce Falls Paper				St. Marys Paper			
	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA
EXTRACTABLES, ACID (PHENOLS)																
2,3,4,5-Tetrachlorophenol																1<T
2,3,4,6-Tetrachlorophenol																<1<W
2,3,5,6-Tetrachlorophenol																<1<W
2,3,4-Trichlorophenol																<1<W
2,3,5-Trichlorophenol																
2,4,5-Trichlorophenol																<1<W
2,4,6-Trichlorophenol	N.D.	N.D.	2.8		N.D.	N.D.	2.6		N.D.	N.D.	2.6		N.D.	N.D.	2.8	<1<W
2,4-Dimethyl phenol																<5<W
2,4-Dinitrophenol																INP
2,4-Dichlorophenol	N.D.	N.D.	2.6		N.D.	N.D.	2.6		N.D.	N.D.	2.6		N.D.	N.D.	2.5	<1<W
2,6-Dichlorophenol																<1<W
4,6-Dinitro-o-cresol																INP
2-Chlorophenol																<1<W
4-Chloro-3-methylphenol																
4-Nitrophenol																<2<W
m-Cresol																<1<W
o-Cresol																<1<W
p-Cresol																INP
Pentachlorophenol																<1<W
Phenol	N.D.	2.2	1.4		N.D.	194	81.8		N.D.	6.1	3.1		N.D.	30	14.9	<1<W
Extractables, Neutrals																
1,2,3,4-Tetrachlorobenzene				NIS								<.001<W				<.001<W
1,2,4,5-Tetrachlorobenzene				NIS								<.001<W				<.001<W
1,2,3,5-Tetrachlorobenzene				NIS								<.001<W				<.001<W
1,2,3-Trichlorobenzene				NIS								<.001<W				<.001<W
1,2,4-Trichlorobenzene				NIS								0.013				<.002<W
2,4,5-Trichlorotoluene				NIS								0.026				<.001<W
Hexachlorobenzene				NIS								<.001<W				<.001<W
Hexachlorobutadiene				NIS								0.012				<.001<W
Hexachlorocyclopentadiene																
Hexachloroethane				NIS								<.001<W				<.001<W
Octachlorostyrene				NIS								NIS				NIS
Pentachlorobenzene				NIS								<.001<W				<.001<W

TABLE 4 (cont)

Pre-Regulation Monitoring EMPPL Data

Corrugating Category

	Domtar Inc., Trenton				MacMillan-Bloedel			
	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA
TOTAL METALS								
Aluminum	1340	7900	3710		2100	2900	2500	
Beryllium								
Cadmium	0.7	3.4	2		4.2	7.3	5.8	
Chromium	N.D.	20	8.8		N.D.	N.D.	5	
Cobalt								
Copper	15	80	43.8		20	40	30	
Lead	8	38.5	18.4		N.D.	7	3.8	
Molybdenum								
Nickel	N.D.	N.D.	5		N.D.	N.D.	5	
Silver								
Thallium	N.D.	20	17.5		N.D.	30	20	
Vanadium								
Zinc	60	200	132.5		840	840	835	
Cyanide	N.D.	10	4.3		N.D.	N.D.	1	4<T
Mercury	0.2	0.88	0.45		N.D.	N.D.	0.025	<.01<
HYDRIDES								
Antimony								
Arsenic	N.D.	2	0.9		N.D.	N.D.	0.5	
Selenium								
VOLATILES, HALOGENATED								
1,1,2,2-Tetrachloroethane								
1,1,2-Trichloroethane	N.D.	N.D.	0.3		N.D.	N.D.	0.3	
1,1-Dichloroethane	N.D.	N.D.	0.1		N.D.	N.D.	0.1	<5<W
1,1-Dichloroethylene								<5<W
1,2-Dichlorobenzene	N.D.	N.D.	0.2		N.D.	N.D.	0.2	<5<W
1,2-Dichloroethane (Ethylene dichloride)	N.D.	N.D.	0.1		N.D.	N.D.	0.1	<5<W
1,2-Dichloropropane	N.D.	N.D.	0.1		N.D.	N.D.	0.1	INP
1,3-Dichlorobenzene	N.D.	N.D.	0.2		N.D.	0.8	0.4	<5<W
1,4-Dichlorobenzene	N.D.	N.D.	0.2		N.D.	N.D.	0.2	<5<W
Bromoform								<5<W
Bromomethane								
Carbon tetrachloride	N.D.	N.D.	0.5		N.D.	N.D.	0.5	<5<W
Chlorobenzene	N.D.	N.D.	0.1		N.D.	N.D.	0.1	<5<W
Chloroform	1	6	3.8		N.D.	0.7	0.4	<5<W
Chloromethane								
Cis-1,3-Dichloropropylene								
Dibromochloromethane	N.D.	N.D.	0.1		N.D.	N.D.	0.1	<5<W
Bromodichloromethane	N.D.	0.2	0.2		N.D.	N.D.	0.1	<5<W
Ethylene dibromide								
Methylene chloride	N.D.	126	38		27	45	36	20<T
Tetrachloroethylene (Perchloroethylene)								
Trans-1,2-Dichloroethylene								<5<W
Trans-1,3-Dichloropropylene								
Trichloroethylene								<5<W
Trichloroethane	N.D.	N.D.	0.1		N.D.	N.D.	0.1	
Trichlorofluoromethane	N.D.	1.8	0.6		N.D.	N.D.	0.25	
Vinyl chloride (Chloroethylene)								

TABLE 4 (cont)

Pre-Regulation Monitoring EMPPL Data

Corrugating Category

	Domtar Inc., Trenton				MacMillan-Bloedel			
	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA
VOLATILES, NON-HALOGENATED								
Benzene	N.D.	N.D.	1		N.D.	20	10.5	5<T
Toluene	N.D.	N.D.	1.5		N.D.	9.5	5.5	<5<W
o-Xylene								<5<W
m-Xylene and p-Xylene								<5<W
EXTRACTABLES, BASE NEUTRAL								
Acenaphthene								<1<W
5-nitro Acenaphthene								
Acenaphthylene	N.D.	N.D.	0.5		N.D.	N.D.	0.5	<1<W
Anthracene	N.D.	N.D.	0.5		N.D.	N.D.	0.5	<1<W
Benz(a)anthracene								<2<W
Benzo(a)pyrene								<2<W
Benzo(b)fluoranthene								<5<W
Benzo(ghi)perylene								<2<W
Benzo(k)fluoranthene								<5<W
Camphene								INP
1-Chloronaphthalene								<1<W
2-Chloronaphthalene								
Chrysene								<1<W
Dibenz(a,h)anthracene								<4<W
Fluoranthene	N.D.	N.D.	0.5		N.D.	N.D.	0.5	<1<W
Fluorene								<1<W
Indeno(1,2,3-cd)pyrene								<1<W
Indole								
1-Methylnaphthalene								<1<W
2-Methylnaphthalene								<1<W
Naphthalene	N.D.	N.D.	0.5		N.D.	N.D.	0.5	<1<W
Perylene								
Phenanthrene	N.D.	1.4	0.7		N.D.	N.D.	0.5	<1<W
Pyrene	N.D.	N.D.	0.5		N.D.	N.D.	0.5	<1<W
Benzyl butyl phthalate	1.2	13.5	5.6		N.D.	3	1.8	<1<W
Bis(2-ethylhexyl) phthalate	2.1	75.8	22.2		3.6	19	11.3	<5<W
Di-n-butyl phthalate	15.3	75.6	33.9		4.5	22	13.3	<1<W
Di-n-octyl phthalate								<2<W
4-Bromophenyl phenyl ether								<1<W
4-Chlorophenyl phenyl ether								<1<W
Bis(2-chloroisopropyl)ether								<1<W
Bis(2-chloroethyl)ether								<3<W
Diphenyl ether								INP
2,4-Dinitrotoluene								<1<W
2,6-Dinitrotoluene								IUI
Bis(2-chloroethoxy)methane								<1<W
Diphenylamine								
N-Nitrosodiphenylamine								<1<W
N-Nitrosodi-n-propylamine								<2<W

TABLE 4 (cont)

Pre-Regulation Monitoring EMPPL Data

Corrugating Category

	Domtar Inc., Trenton				MacMillan-Bloedel			
	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA
EXTRACTABLES, ACID (PHENOLS)								
2,3,4,5-Tetrachlorophenol								<1<W
2,3,4,6-Tetrachlorophenol								<1<W
2,3,5,6-Tetrachlorophenol								<1<W
2,3,4-Trichlorophenol								<1<W
2,3,5-Trichlorophenol								
2,4,5-Trichlorophenol								<1<W
2,4,6-Trichlorophenol	N.D.	N.D.	2.5		N.D.	N.D.	2.5	<1<W
2,4-Dimethyl phenol								<5<W
2,4-Dinitrophenol								INP
2,4-Dichlorophenol	N.D.	N.D.	2.5		N.D.	N.D.	2.5	<1<W
2,6-Dichlorophenol								<1<W
4,6-Dinitro-o-cresol								INP
2-Chlorophenol								<1<W
4-Chloro-3-methylphenol								
4-Nitrophenol								<2<W
m-Cresol								5UIN
o-Cresol								7UIN
p-Cresol								INP
Pentachlorophenol								<1<W
Phenol	252	1170	848.3		785	1000	882.5	247
Extractables, Neutrals								
1,2,3,4-Tetrachlorobenzene								<.001<W
1,2,4,5-Tetrachlorobenzene								<.001<W
1,2,3,5-Tetrachlorobenzene								<.001<W
1,2,3-Trichlorobenzene								<.001<W
1,2,4-Trichlorobenzene								<.002<W
2,4,6-Trichlorotoluene								<.001<W
Hexachlorobenzene								<.001<W
Hexachlorobutadiene								<.001<W
Hexachlorocyclopentadiene								
Hexachloroethane								<.001<W
Octachlorostyrene								NSB
Pentachlorobenzene								<.001<W

TABLE 4 (cont)

Pre-Regulation Monitoring EMPPL Data

Deinking/Board/Fine Paper/Tissue Category

	Fraser Inc.				Beaver Wood Fibre Co. Ltd.				Strathcona Paper Co.				Trent Valley Paperboard			
	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA
TOTAL METALS																
Aluminum	3000	6700	4600		940	6700	2500		400	590	495		3400	4500	3925	
Beryllium																
Cadmium	0.2	2.5	0.9		0.4	1	0.7		0.35	0.7	0.5		0.8	1.3	1	
Chromium	N.D.	40	13.9		N.D.	10	7.5		N.D.	15	8.8		N.D.	20	13.8	
Cobalt																
Copper	10	30	19.8		5	15	9.9		N.D.	N.D.	2.5		20	30	22.5	
Lead	1	3	1.9		N.D.	10	4.1		2	2	2		6	11	7.8	
Molybdenum																
Nickel	N.D.	N.D.	0.5		N.D.	N.D.	5		N.D.	N.D.	5		N.D.	N.D.	5	
Silver																
Thallium	N.D.	20	17.5		N.D.	N.D.	10		N.D.	N.D.	10		N.D.	40	22.5	
Vanadium																
Zinc	60	110	77.5		20	80	60		10	30	20		80	200	115	
Cyanide	N.D.	7	3.3		N.D.	18	5.8		N.D.	2	1.5		N.D.	N.D.	1	
Mercury	N.D.	N.D.	0.025		N.D.	0.01	0.02		N.D.	N.D.	0.03		N.D.	N.D.	0.025	
HYDRIDES																
Antimony																
Arsenic	N.D.	N.D.	0.5		N.D.	2	0.9		N.D.	N.D.	0.5		N.D.	2	0.9	
Selenium																
VOLATILES, HALOGENATED																
1,1,2,2-Tetrachloroethane																
1,1,2-Trichloroethane	N.D.	N.D.	0.3		N.D.	N.D.	0.3		N.D.	N.D.	0.3		N.D.	N.D.	0.3	
1,1-Dichloroethane	N.D.	N.D.	0.1		N.D.	N.D.	0.1		N.D.	N.D.	0.1		N.D.	N.D.	0.1	
1,1-Dichloroethylene																
1,2-Dichlorobenzene	N.D.	N.D.	0.2		N.D.	N.D.	0.2		N.D.	N.D.	0.2		N.D.	N.D.	0.2	
1,2-Dichloroethane (Ethylene dichloride)	N.D.	0.2	0.1		N.D.	N.D.	0.1		N.D.	N.D.	0.1		N.D.	N.D.	0.1	
1,2-Dichloropropane	N.D.	N.D.	0.1		N.D.	N.D.	0.1		N.D.	N.D.	0.1		N.D.	N.D.	0.1	
1,3-Dichlorobenzene	N.D.	N.D.	0.2		N.D.	N.D.	0.2		N.D.	N.D.	0.2		N.D.	N.D.	0.2	
1,4-Dichlorobenzene	N.D.	N.D.	0.2		N.D.	N.D.	0.2		N.D.	N.D.	0.2		N.D.	0.8	0.3	
Bromoform																
Bromomethane																
Carbon tetrachloride	N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5	
Chlorobenzene	5.7	180	36.6		N.D.	N.D.	0.1		N.D.	N.D.	0.1		N.D.	N.D.	0.1	
Chloroform	96.5	240	139.9		N.D.	0.6	0.2		N.D.	0.4	0.3		N.D.	1.1	0.4	
Chloromethane																
Cis-1,3-Dichloropropylene																
Dibromochloromethane	N.D.	1.4	1		N.D.	N.D.	0.1		N.D.	N.D.	0.1		N.D.	N.D.	0.1	
Bromodichloromethane	N.D.	6.9	3.7		N.D.	N.D.	0.1		N.D.	N.D.	0.1		N.D.	N.D.	0.1	
Ethylene dibromide																
Methylene chloride	N.D.	31.2	13.7		N.D.	38	19.8		N.D.	38.3	12.8		N.D.	96.6	46.2	
Tetrachloroethylene (Perchloroethylene)																
Trans-1,2-Dichloroethylene																
Trans-1,3-Dichloropropylene																
Trichloroethylene																
Trichloroethane	N.D.	139	42.7		N.D.	0.2	0.1		N.D.	N.D.	0.1		N.D.	0.6	0.3	
Trichlorofluoromethane	N.D.	N.D.	0.25		N.D.	1.3	0.5		N.D.	1	0.4		N.D.	1.8	0.64	
Vinyl chloride (Chloroethylene)																

TABLE 4 (cont)

Pre-Regulation Monitoring EMPPL Data

Deinking/Board/Fine Paper/Tissue Category

	Fraser Inc.				Beaver Wood Fibre Co. Ltd.				Strathcona Paper Co.				Trent Valley Paperboard			
	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA
VOLATILES, NON-HALOGENATED																
Benzene	N.D.	N.D.	1		N.D.	N.D.	1		N.D.	N.D.	1		N.D.	N.D.	1	
Toluene	3.4	14.2	7.4		N.D.	10	4.1		N.D.	N.D.	1.5		N.D.	6.7	4.4	
o-Xylene																
m-Xylene and p-Xylene																
EXTRACTABLES, BASE NEUTRAL																
Acenaphthene																
5-nitro Acenaphthene																
Acenaphthylene	N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5	
Anthracene	N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5	
Benz(a)anthracene																
Benzo(a)pyrene																
Benzo(b)fluoranthene																
Benzo(ghi)perylene																
Benzo(k)fluoranthene																
Camphene																
1-Chloronaphthalene																
2-Chloronaphthalene																
Chrysene																
Dibenz(a,h)anthracene																
Fluoranthene	N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5	
Fluorene																
Indeno(1,2,3-cd)pyrene																
Indole																
1-Methylnaphthalene																
2-Methylnaphthalene																
Naphthalene	N.D.	43.3	25.6		N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5	
Perylene																
Phenanthrene	N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5	
Pyrene	N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5	
Benzyl butyl phthalate	N.D.	5.5	2.5		N.D.	18	5.3		N.D.	N.D.	0.5		2	5.7	3.3	
Bis(2-ethylhexyl) phthalate	6.4	13.7	8.9		4.2	45.4	20.9		2.4	13	5.8		2.3	12.4	6.1	
Di-n-butyl phthalate	12.9	130	47.5		8	176	64.7		3.3	7.9	5.3		26.6	168	83.1	
Di-n-octyl phthalate																
4-Bromophenyl phenyl ether																
4-Chlorophenyl phenyl ether																
Bis(2-chloroisopropyl)ether																
Bis(2-chloroethyl)ether																
Diphenyl ether																
2,4-Dinitrotoluene																
2,6-Dinitrotoluene																
Bis(2-chloroethoxy)methane																
Diphenylamine																
N-Nitrosodiphenylamine																
N-Nitrosodi-n-propylamine																

TABLE 4 (cont)

Pre-Regulation Monitoring EMPPL Data

Deinking/Board/Fine Paper/Tissue Category

	Fraser Inc.				Beaver Wood Fibre Co. Ltd.				Strathcona Paper Co.				Trent Valley Paperboard			
	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA
EXTRACTABLES, ACID (PHENOLS)																
2,3,4,5-Tetrachlorophenol																
2,3,4,6-Tetrachlorophenol																
2,3,5,6-Tetrachlorophenol																
2,3,4-Trichlorophenol																
2,3,5-Trichlorophenol																
2,4,5-Trichlorophenol																
2,4,6-Trichlorophenol	N.D.	N.D.	2.5		N.D.	N.D.	2.5		N.D.	N.D.	2.5		N.D.	N.D.	2.6	
2,4-Dimethyl phenol																
2,4-Dinitrophenol																
2,4-Dichlorophenol	N.D.	N.D.	2.5		N.D.	N.D.	2.5		N.D.	N.D.	2.5		N.D.	N.D.	2.5	
2,6-Dichlorophenol																
4,6-Dinitro-o-cresol																
2-Chlorophenol																
4-Chloro-3-methylphenol																
4-Nitrophenol																
m-Cresol																
o-Cresol																
p-Cresol																
Pentachlorophenol																
Phenol	N.D.	N.D.	1		N.D.	21.2	10.9		N.D.	N.D.	1		92	161	124.3	
Extractables, Neutrals																
1,2,3,4-Tetrachlorobenzene																
1,2,4,5-Tetrachlorobenzene																
1,2,3,5-Tetrachlorobenzene																
1,2,3-Trichlorobenzene																
1,2,4-Trichlorobenzene																
2,4,5-Trichlorotoluene																
Hexachlorobenzene																
Hexachlorobutadiene																
Hexachlorocyclopentadiene																
Hexachloroethane																
Octachlorostyrene																
Pentachlorobenzene																

TABLE 4 (cont)

Pre-Regulation Monitoring EMPPL Data

Deinking/Board/Fine Paper/Tissue Category

	Domtar Inc., St. Catharines				E.B. Eddy, Ottawa				Kimberly Clark, Huntsville				Kimberly Clark, St. Catharines			
	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA
TOTAL METALS																
Aluminum	800	1280	1040		1140	7500	3175		80	240	130		180	340	230	
Beryllium																
Cadmium	0.2	0.3	0.3		0.2	0.8	0.5		0.1	0.5	0.3		0.2	0.6	0.4	
Chromium	N.D.	10	6.3		N.D.	10	7.5		N.D.	N.D.	5		N.D.	N.D.	5	
Cobalt																
Copper	N.D.	15	7.5		10	35	18.8		N.D.	15	10.6		N.D.	10	5	
Lead	N.D.	1	0.6		N.D.	4	2.1		N.D.	2	1		N.D.	1	0.9	
Molybdenum																
Nickel	N.D.	30	11.3		N.D.	10	7.5		N.D.	N.D.	5		N.D.	N.D.	5	
Silver																
Thallium	N.D.	30	10		N.D.	N.D.	10		N.D.	N.D.	10		N.D.	N.D.	10	
Vanadium																
Zinc	N.D.	70	28.8		10	50	20		N.D.	10	8.8		N.D.	20	13.8	
Cyanide	N.D.	N.D.	1		N.D.	N.D.	1		N.D.	N.D.	1		N.D.	N.D.	1	
Mercury	N.D.	N.D.	0.025		0.05	N.D.	0.031		N.D.	N.D.	0.025		N.D.	N.D.	0.025	
HYDRIDES																
Antimony																
Arsenic	N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5	
Selenium																
VOLATILES, HALOGENATED																
1,1,2,2-Tetrachloroethane																
1,1,2-Trichloroethane	N.D.	N.D.	0.3		N.D.	N.D.	0.3		N.D.	N.D.	0.3		N.D.	N.D.	0.3	
1,1-Dichloroethane	N.D.	N.D.	0.1		N.D.	N.D.	0.1		N.D.	N.D.	0.1		0.2	4.8	2.7	
1,1-Dichloroethylene																
1,2-Dichlorobenzene	N.D.	N.D.	0.2		N.D.	N.D.	0.2		N.D.	N.D.	0.2		N.D.	N.D.	0.2	
1,2-Dichloroethane (Ethylene dichloride)	N.D.	N.D.	0.1		N.D.	N.D.	0.1		N.D.	N.D.	0.1		N.D.	0.2	0.1	
1,2-Dichloropropane	N.D.	N.D.	0.1		N.D.	N.D.	0.1		N.D.	N.D.	0.1		N.D.	N.D.	0.1	
1,3-Dichlorobenzene	N.D.	N.D.	0.2		N.D.	N.D.	0.2		N.D.	N.D.	0.2		N.D.	N.D.	0.2	
1,4-Dichlorobenzene	N.D.	2.2	1.7		N.D.	N.D.	0.2		N.D.	N.D.	0.2		N.D.	N.D.	0.2	
Bromoform																
Bromomethane																
Carbon tetrachloride	N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5	
Chlorobenzene	N.D.	N.D.	0.1		N.D.	N.D.	0.1		N.D.	N.D.	0.1		N.D.	N.D.	0.1	
Chloroform	0.2	7.2	2.1		3	4.8	4		N.D.	4.2	2.4		0.4	7.3	2.2	
Chloromethane																
Cis-1,3-Dichloropropylene																
Dibromochloromethane	N.D.	N.D.	0.1		N.D.	N.D.	0.1		N.D.	N.D.	0.1		N.D.	N.D.	0.1	
Bromodichloromethane	N.D.	N.D.	0.1		N.D.	N.D.	0.1		N.D.	N.D.	0.1		N.D.	N.D.	0.1	
Ethylene dibromide																
Methylene chloride	N.D.	24.7	11.7		N.D.	64.8	31.8		N.D.	10.5	6.5		19	122	60	
Tetrachloroethylene (Perchloroethylene)																
Trans-1,2-Dichloroethylene																
Trans-1,3-Dichloropropylene																
Trichloroethylene																
Trichloroethane	N.D.	N.D.	0.1		N.D.	N.D.	0.1		N.D.	N.D.	0.1		N.D.	N.D.	0.1	
Trichlorofluoromethane	N.D.	1.7	0.8		N.D.	N.D.	0.25		N.D.	N.D.	0.25		N.D.	N.D.	0.25	
Vinyl chloride (Chloroethylene)																

TABLE 4 (cont)

Pre-Regulation Monitoring EMPPL Data

Deinking/Board/Fine Paper/Tissue Category

	Domtar Inc., St. Catharines				E.B. Eddy, Ottawa				Kimberly Clark, Huntsville				Kimberly Clark, St. Catharines			
	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA
VOLATILES, NON-HALOGENATED																
Benzene	N.D.	N.D.	1		N.D.	N.D.	1		N.D.	N.D.	1		N.D.	N.D.	1	
Toluene	N.D.	3.3	2		N.D.	7.6	3		N.D.	N.D.	1.5		N.D.	16	7.6	
o-Xylene																
m-Xylene and p-Xylene																
EXTRACTABLES, BASE NEUTRAL																
Acenaphthene																
5-nitro Acenaphthene																
Acenaphthylene	N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5	
Anthracene	N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5	
Benz(a)anthracene																
Benzo(a)pyrene																
Benzo(b)fluoranthene																
Benzo(ghi)perylene																
Benzo(k)fluoranthene																
Camphene																
1-Chloronaphthalene																
2-Chloronaphthalene																
Chrysene																
Dibenz(a,h)anthracene																
Fluoranthene	N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5	
Fluorene																
Indeno(1,2,3-cd)pyrene																
Indole																
1-Methylnaphthalene																
2-Methylnaphthalene																
Naphthalene	N.D.	N.D.	0.5		N.D.	1.4	0.9		N.D.	N.D.	0.5		5.8	10.1	7.8	
Perylene																
Phenanthrene	N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5	
Pyrene	N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5		N.D.	N.D.	0.5	
Benzyl butyl phthalate	N.D.	1.2	0.7		N.D.	13	3.6		N.D.	N.D.	0.5		N.D.	1.9	0.9	
Bis(2-ethylhexyl) phthalate	N.D.	7	3.7		2.4	127	42.4		N.D.	15.8	6.1		N.D.	11	4.6	
Di-n-butyl phthalate	5.2	14	8.6		7.3	190	58.4		3.7	50.8	25.5		7.9	30.4	17.8	
Di-n-octyl phthalate																
4-Bromophenyl phenyl ether																
4-Chlorophenyl phenyl ether																
Bis(2-chloroisopropyl)ether																
Bis(2-chloroethyl)ether																
Diphenyl ether																
2,4-Dinitrotoluene																
2,6-Dinitrotoluene																
Bis(2-chloroethoxy)methane																
Diphenylamine																
N-Nitrosodiphenylamine																
N-Nitrosodi-n-propylamine																

TABLE 4 (cont)

Pre-Regulation Monitoring EMPPL Data

Deinking/Board/Fine Paper/Tissue Category

	Domtar Inc., St. Catharines				E.B. Eddy, Ottawa				Kimberly Clark, Huntsville				Kimberly Clark, St. Catharines			
	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA	MIN	MAX	MEAN	MDATA
EXTRACTABLES, ACID (PHENOLS)																
2,3,4,5-Tetrachlorophenol																
2,3,4,6-Tetrachlorophenol																
2,3,5,6-Tetrachlorophenol																
2,3,4-Trichlorophenol																
2,3,5-Trichlorophenol																
2,4,5-Trichlorophenol																
2,4,6-Trichlorophenol	N.D.	N.D.	2.5		N.D.	N.D.	2.5		N.D.	N.D.	2.5		N.D.	N.D.	2.5	
2,4-Dimethyl phenol																
2,4-Dinitrophenol																
2,4-Dichlorophenol	N.D.	N.D.	2.5		N.D.	N.D.	2.5		N.D.	N.D.	2.5		N.D.	N.D.	2.5	
2,6-Dichlorophenol																
4,6-Dinitro-o-cresol																
2-Chlorophenol																
4-Chloro-3-methylphenol																
4-Nitrophenol																
m-Cresol																
o-Cresol																
p-Cresol																
Pentachlorophenol																
Phenol	N.D.	N.D.	1		N.D.	N.D.	1		N.D.	N.D.	1		N.D.	N.D.	1	
Extractables, Neutrals																
1,2,3,4-Tetrachlorobenzene																
1,2,4,5-Tetrachlorobenzene																
1,2,3,5-Tetrachlorobenzene																
1,2,3-Trichlorobenzene																
1,2,4-Trichlorobenzene																
2,4,5-Trichlorotoluene																
Hexachlorobenzene																
Hexachlorobutadiene																
Hexachlorocyclopentadiene																
Hexachloroethane																
Octachlorostyrene																
Pentachlorobenzene																

TABLE 5

List of Target Parameters Analyzed (Industry)

Volatile Organics

- Benzene
- Bromodichloromethane
- Bromoform
- Bromomethane
- Carbon tetrachloride
- Chlorobenzene
- Chloroethane
- 2-Chloroethyl vinyl ether
- Chloroform
- Chloromethane
- Dibromochloromethane
- 1,2-Dichlorobenzene
- 1,3-Dichlorobenzene
- 1,4-Dichlorobenzene
- 1,1-Dichloroethylene
- 1,1-Dichloroethane
- 1,2-Dichloroethane
- trans-1,2-Dichloroethylene
- Dichloromethane
- 1,2-Dichloropropane
- cis-1,3-Dichloropropene
- trans-1,3-Dichloropropene
- Ethylbenzene
- Methylstyrene isomers
- Mesitylene
- Styrene
- 1,1,2,2-Tetrachloroethane
- Tetrachloroethylene
- Toluene
- 1,1,1-Trichloroethane
- 1,1,2-Trichloroethane
- Trichloroethylene
- Trichlorofluoromethane
- m+p-Xylene
- o-Xylene
- Vinyl chloride

Base/Neutral Extractables

- Acenaphthene
- Acenaphthylene
- Anthracene
- Benzidine
- Benz(a)anthracene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Benzo(a)pyrene
- Benzo(ghi)perylene
- Benzyl butyl phthalate
- Bis(2-chloroethyl)ether
- Bis(2-chloroethoxy)methane
- Bis(2-ethylhexyl)phthalate
- Bis(2-chloroisopropyl)ether
- 4-Bromophenyl phenyl ether
- 2-Chloronaphthalene
- 4-Chlorophenyl phenyl ether
- Chrysene
- Dibenz(a,h)anthracene
- Di-n-butyl phthalate
- 1,3-Dichlorobenzene
- 1,4-Dichlorobenzene
- 1,2-Dichlorobenzene
- 3,3'-Dichlorobenzidine
- Diethyl phthalate
- Dimethyl phthalate
- 2,4-Dinitrotoluene
- 2,6-Dinitrotoluene
- 1,2-Diphenylhydrazine
- Di-n-octyl phthalate
- Fluoranthene
- Fluorene
- Hexachlorobenzene
- Hexachlorobutadiene
- Hexachlorocyclopentadiene
- Hexachloroethane
- Indeno(1,2,3-cd)pyrene
- Isophorone
- Naphthalene
- Nitrobenzene
- N-Nitroso-di-n-propylamine
- N-Nitrosodiphenylamine
- Phenanthrene
- Pyrene
- 1,2,4-Trichlorobenzene

TABLE 5 (cont)

List of Target Parameters Analyzed (Industry)

Acid Extractables

Phenol
2-Chlorophenol
2,4-Dimethylphenol
4-Chloro-3-methylphenol
2,4-Dichlorophenol
2,4,6-Trichlorophenol

2-Nitrophenol
2,4-Dinitrophenol
2-Methyl-4,6-dinitrophenol
4-Nitrophenol
Pentachlorophenol

Organo-Chlorine Pesticides and PCBs

Aroclor 1242
Aroclor 1254
Aroclor 1260
α-BHC
β-BHC
γ-BHC
Lindane
Heptachlor
Aldrin
Heptachlor epoxide
cis-Chlordane

Endosulfan I
trans-Chlordane
Dieldrin
p,p'-DDE
Endrin
p,p'-DDD
Endosulfan II
Endosulfan sulfate
Endrin aldehyde
p,p'-DDT
Toxaphene

Inorganics

Aluminum
Antimony
Arsenic
Beryllium
Cadmium
Chromium
Copper
Lead
Magnesium
Mercury
Nickel
Selenium
Silver
Thallium
Zinc

Chloride
Nitrite
Nitrate
Sulphate
Total phosphate-P
Total Kjeldahl nitrogen
Ammonia nitrogen

Calcium
Potassium
Sodium

Cyanide

Others

Rainbow trout 96-h LC_{50}
Biochemical oxygen demand (BOD_5)
Suspended solids
pH

TABLE 6

Tracking Parameters After Initial Data Screening (Industry)

PARAMETER RETAINED	PARAMETER ELIMINATED
Volatiles:	
Benzene (*)	Bromoform
Bromodichloromethane (*)	Bromomethane
Carbon tetrachloride (*)	Chloroethane
Chlorobenzene (*)	2-Chloromethyl vinyl ether
Chloroform (*)	Chloromethane
Dibromochloromethane (*)	trans-1,2-Dichloroethylene
1,2-Dichlorobenzene (*)	cis-1,3-Dichloropropene
1,3-Dichlorobenzene (*)	trans-1,3-Dichloropropene
1,4-Dichlorobenzene (*)	Methylstyrene isomers
1,1-Dichloroethylene (*)	Mesitylene
1,1-Dichloroethane (*)	Styrene
1,2-Dichloroethane (*)	1,1,2,2-Tetrachloroethane
Dichloromethane	m- + p-Xylene
1,2-Dichloropropane (*)	o-Xylene
Ethylbenzene (*)	Vinyl Chloride
Tetrachloroethylene (*)	
Toluene (*)	
1,1,1-Trichloroethane (*)	
1,1,2-Trichloroethane	
Trichloroethylene (*)	
Trichlorofluoromethane	
Base/Neutral Extractables:	
Acenaphthylene (*)	Acenaphthene
Anthracene	Benzidine
Benzyl butyl phthalate	Benz(a)anthracene
Bis(2-ethylhexyl) phthalate	Benzo(b)fluoranthene
Di-n-butyl phthalate	Benzo(k)fluoranthene
1,3-Dichlorobenzene	Benzo(a)pyrene
Diethyl phthalate	Benzo(ghi)perylene
Dimethyl phthalate	Bis(2-chloroethyl) ether
Fluoranthene (*)	Bis(2-chloroethoxy) methane
Isophorone	Bis(2-chloroisopropyl)
ether	
Naphthalene (*)	4-Bromophenyl phenyl ether
Phenanthrene (*)	2-Chloronaphthalene
Pyrene	4-Chlorophenyl phenyl ether
	Chrysene
	Dibenz(a,h)anthracene
	1,4-Dichlorobenzene
	1,2-Dichlorobenzene
	3,3'-Dichlorobenzidine
	2,4-Dinitrotoluene
	2,6-Dinitrotoluene
	1,2-Diphenylhydrazine

TABLE 6 (cont)

Tracking Parameters After Initial Data Screening (Industry)

PARAMETER RETAINED	PARAMETER ELIMINATED
	Di-n-octyl phthalate
	Fluorene
	Hexachlorobenzene
	Hexachlorobutadiene
	Hexachlorocyclopentadiene
	Hexachloroethane
	Indeno(1,2,3-cd)pyrene
	Nitrobenzene
	N-Nitroso-di-n-propylamine
	N-Nitrosodiphenylamine
	1,2,4-Trichlorobenzene
Acid Extractables:	
Phenol (*)	2-Chlorophenol
2,4-Dichlorophenol (*)	2,4-Dimethylphenol
2,4,6-Trichlorophenol(*)	4-Chloro-3-methylphenol
	2-Nitrophenol
	2,4-Dinitrophenol
	2-Methyl-4,6-dinitrophenol
	4-Nitrophenol
	Pentachlorophenol
Organochlorine Pesticides and PCBs:	
	Aroclor 1242
	Aroclor 1254
	Aroclor 1260
	α-BHC
	β-BHC
	γ-BHC
	Lindane
	Heptachlor
	Aldrin
	Heptachlor epoxide
	cis-Chlordane
	Endosulfan I
	trans-Chlorodane
	Dieldrin
	p,p'-DDE
	Endrin
	p,p'-DDD
	Endosulfan II
	Endosulfan sulfate
	Endrin aldehyde
	p,p'-DDT
	Toxaphene

TABLE 6 (cont)

Tracking Parameters After Initial Data Screening (Industry)

PARAMETER RETAINED	PARAMETER ELIMINATED
Inorganics:	
Aluminum (*)	Antimony
Arsenic	Beryllium
Cadmium (*)	Selenium
Chromium (*)	Silver
Copper (*)	
Lead (*)	
Magnesium (*)	
Mercury (*)	
Nickel (*)	
Thallium (*)	
Zinc (*)	
Chloride (*)	
Nitrite (*)	
Nitrate (*)	
Sulphate (*)	
Total phosphate-P (*)	
Total Kjeldahl nitrogen (*)	
Total ammonia nitrogen (*)	
Calcium (*)	
Potassium (*)	
Sodium (*)	
Cyanide (*)	
Others:	
BOD_5	-
TSS	
pH	
Rainbow trout LC_{50}	

(*) Indicate parameters which were considered relevant to the industry as listed on Table 3.2.

TABLE 7

Cost of Analysis

	DISCHARGE	TOT DAILY	MISA	COST PER	TOTAL
KRAFT MILLS	POINT	VOLUME	CLASS	DISCHARGE	COST **
*Boise-Cascade Canada Ltd., Fort Frances	Final Effluent	93,000	G+K	$162,581.00	$164,363.00
	Point Source Storm Water Effluent		T,W	$930.00	
	Point Source Storm Water Effluent		W	$852.00	
*Canadian Pacific Forest Products Ltd, Dryden	Final Effluent	84,000	G+K	$162,581.00	$166,807.00
	Point Source Storm Water Effluent		T,F	$1,372.00	
	Point Source Storm Water Effluent		C	$852.00	
	Point Source Storm Water Effluent		B	$852.00	
	Point Source Storm Water Effluent		D,W,C	$1,150.00	
Canadian Pacific Forest Products Ltd, Thunder Bay	Final Effluent	152,000	G+K	$158,041.00	$172,181.00
	Clean Water Outfall	70,000	CWE	$8,940.00	
	Point Source Storm Water Effluent		T	$122.00	
	Point Source Storm Water Effluent		F	$1,372.00	
	Point Source Storm Water Effluent		C,B	$852.00	
	Point Source Storm Water Effluent		D,W	$1,150.00	
	Point Source Storm Water Effluent		W	$852.00	
	Point Source Storm Water Effluent		W,C	$852.00	
Domtar Inc., Fine Papers Division, Cornwall	Final Effluent	102,400	G+K	$158,041.00	$162,193.00
	Point Source Storm Water Effluent		D	$1,100.00	
	Point Source Storm Water Effluent		D	$1,100.00	
	Point Source Storm Water Effluent		W	$852.00	
	Point Source Storm Water Effluent		D	$1,100.00	
Domtar Inc., Containerboard Division, Red Rock	Final Effluent	91,000	G+K	$158,041.00	$158,973.00
	Point Source Storm Water Effluent		C,T	$932.00	
*E.B. Eddy Forest Products Ltd., Espanola	Final Effluent	102,000	G+K	$135,897.00	$296,820.00
	Clarifier Overflow	15,600	G+K	$158,041.00	
	Point Source Storm Water Effluent		T,C	$930.00	
	Point Source Storm Water Effluent		W,C,B	$852.00	
	Point Source Storm Water Effluent		D	$1,100.00	

TABLE 7 (cont)

Cost of Analysis

KRAFT MILLS	DISCHARGE POINT	TOT DAILY VOLUME	MISA CLASS	COST PER DISCHARGE	TOTAL COST ***
James River Marathon, Marathon	Final Effluent	64,530	G+K	$158,041.00	$179,749.00
	Cooling Water		CWE	$8,940.00	
	Cooling Water		CWE	$8,940.00	
	Point Source Storm Water Effluent		T	$122.00	
	Point Source Storm Water Effluent		C	$852.00	
	Point Source Storm Water Effluent		W	$852.00	
	Point Source Storm Water Effluent		B	$852.00	
	Point Source Storm Water Effluent		B,D	$1,150.00	
Kimberly-Clark of Canada Limited, Terrace Bay	Alkaline Sewer + Acid Sewer	121,120	G+K	$158,041.00	$159,867.00
	Combined Sample				
	Point Source Storm Water Effluent		W	$852.00	
	Point Source Storm Water Effluent		C	$852.00	
	Point Source Storm Water Effluent		T	$122.00	
Malette Kraft Pulp & Power Div., Smooth Rock Falls	Final Effluent	53,000	G+K	$158,041.00	$167,721.00
	Waste Disposal Site Effluent		WDSE	$7,776.00	
	Point Source Storm Water Effluent		T,W,C	$930.00	
	Point Source Storm Water Effluent		T	$122.00	
	Point Source Storm Water Effluent		W	$852.00	
MECHANICAL/SULPHITE					
Abitibi-Price, Fort William Division	Final Effluent	10,200	G+S/M	$104,509.00	$194,586.00
	Bark Lagoon Effluent	4,460	G+S/M	$88,373.00	
	Point Source Storm Water Effluent		W,C,B	$852.00	
	Point Source Storm Water Effluent		W,B	$852.00	
Abitibi-Price, Iroquois Falls Division	Final Effluent	53,300	G+S/M	$95,913.00	$109,367.00
	Filter Plant Backwash		BWE	$1,632.00	
	Cooling Water		CWE	$8,940.00	
	Point Source Storm Water Effluent		D	$1,100.00	
	Point Source Storm Water Effluent		W	$852.00	
	Point Source Storm Water Effluent		T,C,B	$930.00	

TABLE 7 (cont)

Cost of Analysis

	DISCHARGE POINT	TOT DAILY VOLUME	MISA CLASS	COST PER DISCHARGE	TOTAL COST ***
MECHANICAL/SULPHITE					
Abitibi-Price, Thunder Bay Division	Final Effluent	35,000	G+S/M	$95,913.00	$97,617.00
	Point Source Storm Water Effluent		C	$852.00	
	Point Source Storm Water Effluent		W	$852.00	
Abitibi-Price Fine Papers Division	Final Effluent	47,000	G+S/M	$104,509.00	$106,511.00
	Point Source Storm Water Effluent		D,W,B	$1,150.00	
	Point Source Storm Water Effluent		W	$852.00	
Boise-Cascade Canada Ltd., Kenora	Final Effluent	48,800	G+S/M	$104,509.00	$105,439.00
	Point Source Storm Water Effluent		T,W,B	$930.00	
***Quebec And Ontario Paper Company Ltd.**	Final Effluent	85,600	G+S/M	$100,453.00	$100,453.00
Spruce Falls Power and Paper Company Limited	Final Effluent	87,000	G+S/M	$104,509.00	$107,907.00
	Point Source Storm Water Effluent		T	$122.00	
	Point Source Storm Water Effluent		T,F	$1,372.00	
	Point Source Storm Water Effluent		T,W,C	$930.00	
	Point Source Storm Water Effluent		T	$122.00	
	Point Source Storm Water Effluent		W	$852.00	
St Marys Paper Inc.	Final Effluent	15,700	G+S/M	$104,509.00	$104,509.00
CORRUGATING MILLS					
Domtar Inc., Containerboard Division, Trenton	Final Effluent	3,700	G+C	$95,913.00	$99,143.00
	Point Source Storm Water Effluent		T,W	$930.00	
	Point Source Storm Water Effluent		D,W,R	$1,150.00	
	Point Source Storm Water Effluent		D,W	$1,150.00	
MacMillan-Bloedel Ltd.	Black Liquor Overflow	1,790	G+C	$95,913.00	$259,693.00
	Clean Water Effluent	5,350	G+C	$79,777.00	
	Clarifier Overflow	3,620	G+C	$79,777.00	
	Point Source Storm Water Effluent		W,C	$852.00	
	Point Source Storm Water Effluent		D,C	$1,150.00	
	Point Source Storm Water Effluent		W	$852.00	
	Point Source Storm Water Effluent		F	$1,372.00	

TABLE 7 (cont)

Cost of Analysis

DEINKING/BOARD/FINE PAPER/TISSUE	DISCHARGE POINT	TOT DAILY VOLUME	MISA CLASS	COST PER DISCHARGE	TOTAL COST ***
Beaver Wood Fibre Co. Ltd.	Final Effluent	13,800	G+D/B/FP/T	$74,633.00	$83,573.00
	Spill Pond Overflow	200	CWE	$8,940.00	
Domtar Inc, Fine Papers Division, St. Catharines	Final Effluent	9,752	G+D/B/FP/T	$83,229.00	$83,229.00
E.B. Eddy Forest Products Ltd., Ottawa	Final Effluent	7,950	G+D/B/FP/T	$83,229.00	$83,229.00
*Fraser Inc, Thorold	Final Effluent	25,300	G+D/B/FP/T	$102,821.00	$102,821.00
Kimberly-Clark of Canada Limited, Huntsville	Final Effluent	425	G+D/B/FP/T	$83,229.00	$83,351.00
	Point Source Storm Water Effluent		T	$122.00	
Kimberly-Clark of Canada Limited, St. Catharines	Final Effluent	10,066	G+D/B/FP/T	$83,229.00	$83,229.00
*Strathcona Paper Company, Strathcona	Final Effluent	3,200	G+D/B/FP/T	$74,633.00	$83,573.00
	Cooling Water & Filter Plant BW		CWE	$8,940.00	
Trent Valley Paperboard Mills Division, Trenton	Final Effluent	2,400	G+D/B/FP/T	$74,633.00	$119,919.00
	Cooling Water		CWE	$8,940.00	
	Cooling Water		CWE	$8,940.00	
	Cooling Water		CWE	$8,940.00	
	Cooling Water		CWE	$8,940.00	
	Cooling Water		CWE	$8,940.00	
	Point Source Storm Water Effluent		R	$586.00	
		TOTAL COST TO INDUSTRY:			$3,636,823.00
		AVERAGE COST PER MILL:			$134,697.15

TABLE 7 (cont)

Cost of Analysis

Explanation of symbols used.					
G+K	Process effluent general requirements plus Kraft Mill requirements				
G+S/M	Process Effluent general requirements plus Sulphite-Mechanical requirements				
G+C	Process effluent general requirements plus Corrugating Mill requirements				
G+D/B/FP/T	Process effluent general requirements plus Deinking-Board-Fine Paper-Tissue requirements				
CWE	Cooling Water Effluent general requirements				
BWE	Backwash Effluent general requirements				
WDSE	Waste disposal Site Effluent requirements				
B	Point source storm water effluent, bark storage requirements				
C	Point source storm water effluent, chip storage requirements				
D	Point source storm water effluent, disposal site requirements				
F	Point source storm water effluent, coal storage requirements				
R	Point source storm water effluent, waste paper storage requirements				
T	Point source storm water effluent, bulk storage and unloading requirements				
W	Point source storm water effluent, wood storage requirements				
*	Operate a biological treatment plant				
**	Total cost does not include cost of collecting samples or the cost of transporting of samples.				

TABLE 8

Cost of Analysis per Effluent Stream

COST OF ANALYSIS FOR A KRAFT MILL PROCESS EFFLUENT WITHOUT BIOLOGICAL TREATMENT

TEST	ROUT	QA/QC			COST/TEST	COST
	MON	Dup.	TB	TSB		
DOC/COD	365	12	0	0	$30.00	$11,310.00
pH (ATG. 3)	365	12	0	0	$7.00	$2,639.00
Conductance (ATG. 7)	365	12	0	0	$9.00	$3,393.00
TSS (ATG. 8a)	365	12	0	0	$15.00	$5,655.00
BOD5	156	12	0	0	$25.00	$4,200.00
AOX	156	12	0	0	$250.00	$42,000.00
DHA & DCDHA (ATG. 26)	144	8	4	4	$133.00	$21,280.00
Al & Zn (ATG. 9)	40	0	0	0	$84.00	$3,360.00
ATG. 4a & 4b	12	4	0	0	$87.00	$1,392.00
ATG. 6	12	4	0	0	$25.00	$400.00
ATG. 9	12	4	2	2	$84.00	$1,680.00
ATG. 12	12	4	2	2	$26.00	$520.00
ATG. 15	12	4	0	0	$30.00	$480.00
ATG. 16	12	4	2	2	$240.00	$4,800.00
ATG. 17	12	4	2	2	$177.00	$3,540.00
ATG. 19	12	4	2	2	$428.00	$8,560.00
ATG. 20	12	4	2	2	$246.00	$4,920.00
ATG. 23	12	4	2	2	$232.00	$4,640.00
ATG. 24	12	4	2	0	$1,228.00	$22,104.00
ATG. 26	12	4	2	2	$133.00	$2,660.00
Toxicity Test	12	0	0	0	$600.00	$7,200.00
ATG. 27	2	0	0	0	$104.00	$208.00
Open Characterization	2	0	0	0	$550.00	$1,100.00

TOTAL COST $158,041.00

TABLE 8 (cont)

Cost of Analysis per Effluent Stream

COST OF ANALYSIS FOR A KRAFT MILL PROCESS EFFLUENT WITH BIOLOGICAL TREATMENT

TEST	ROUT	QA/QC			COST/TEST	COST
	MON	Dup.	TB	TSB		
DOC/COD	365	12	0	0	$30.00	$11,310.00
pH (ATG. 3)	365	12	0	0	$7.00	$2,639.00
Conductance (ATG. 7)	365	12	0	0	$9.00	$3,393.00
TSS (ATG. 8a)	365	12	0	0	$15.00	$5,655.00
BOD5	156	12	0	0	$25.00	$4,200.00
AOX	156	12	0	0	$250.00	$42,000.00
DHA & DCDHA (ATG. 26)	144	8	4	4	$133.00	$21,280.00
Al & Zn (ATG. 9)	40	0	0	0	$84.00	$3,360.00
ATG. 4a & 4b	52	4	0	0	$87.00	$4,872.00
ATG. 6	52	4	0	0	$25.00	$1,400.00
VSS (ATG. 8b)	-	4	0	0	$15.00	$60.00
ATG. 9	12	4	2	2	$84.00	$1,680.00
ATG. 12	12	4	2	2	$26.00	$520.00
ATG. 15	12	4	0	0	$30.00	$480.00
ATG. 16	12	4	2	2	$240.00	$4,800.00
ATG. 17	12	4	2	2	$177.00	$3,540.00
ATG. 19	12	4	2	2	$428.00	$8,560.00
ATG. 20	12	4	2	2	$246.00	$4,920.00
ATG. 23	12	4	2	2	$232.00	$4,640.00
ATG. 24	12	4	2	0	$1,228.00	$22,104.00
ATG. 26	12	4	2	2	$133.00	$2,660.00
Toxicity Test	12	0	0	0	$600.00	$7,200.00
ATG. 27	2	0	0	0	$104.00	$208.00
Open Characteriation	2	0	0	0	$550.00	$1,100.00

TOTAL COST	$162,581.00

TABLE 8 (cont)

Cost of Analysis per Effluent Stream

COST OF ANALYSIS FOR A KRAFT MILL PROCESS EFFLUENT WITH BIOLOGICAL TREATMENT NO QA/QC REQUIREMENTS

TEST		ROUT	QA/QC			COST/TEST	COST
		MON	Dup.	TB	TSB		
DOC/COD		365	0	0	0	$30.00	$10,950.00
pH	(ATG. 3)	365	0	0	0	$7.00	$2,555.00
Conductance	(ATG. 7)	365	0	0	0	$9.00	$3,285.00
TSS	(ATG. 8a)	365	0	0	0	$15.00	$5,475.00
BOD5		156	0	0	0	$25.00	$3,900.00
AOX		156	0	0	0	$250.00	$39,000.00
DHA & DCDHA	(ATG. 26)	144	0	0	0	$133.00	$19,152.00
Al & Zn	(ATG. 9)	40	0	0	0	$84.00	$3,360.00
ATG. 4a & 4b		52	0	0	0	$87.00	$4,524.00
ATG. 6		52	0	0	0	$25.00	$1,300.00
ATG. 9		12	0	0	0	$84.00	$1,008.00
ATG. 12		12	0	0	0	$26.00	$312.00
ATG. 15		12	0	0	0	$30.00	$360.00
ATG. 16		12	0	0	0	$240.00	$2,880.00
ATG. 17		12	0	0	0	$177.00	$2,124.00
ATG. 19		12	0	0	0	$428.00	$5,136.00
ATG. 20		12	0	0	0	$246.00	$2,952.00
ATG. 23		12	0	0	0	$232.00	$2,784.00
ATG. 24		12	0	0	0	$1,228.00	$14,736.00
ATG. 26		12	0	0	0	$133.00	$1,596.00
Toxicity Test		12	0	0	0	$600.00	$7,200.00
ATG. 27		2	0	0	0	$104.00	$208.00
Open Characterization		2	0	0	0	$550.00	$1,100.00

TOTAL COST $135,897.00

TABLE 8 (cont)

Cost of Analysis per Effluent Stream

COST OF ANALYSIS FOR A SULFITE/MECHANICAL MILL PROCESS STREAM WITH BIOLOGICAL TREATMENT AND THE MILL DOES NOT MANUFACTURE OR USE BLEACHED PULP

TEST	ROUT	QA/QC			COST/TEST	COST
	MON	Dup.	TB	TSB		
DOC/COD	365	12	0	0	$30.00	$11,310.00
pH (ATG. 3)	365	12	0	0	$7.00	$2,639.00
Conductance (ATG. 7)	365	12	0	0	$9.00	$3,393.00
TSS (ATG. 8a)	365	12	0	0	$15.00	$5,655.00
BOD5	156	12	0	0	$25.00	$4,200.00
DHA & DCDHA (ATG. 26)	144	8	4	4	$133.00	$21,280.00
Al & Zn (ATG. 9)	40	0	0	0	$84.00	$3,360.00
ATG. 4a & 4b	52	4	0	0	$87.00	$4,872.00
ATG. 6	52	4	0	0	$25.00	$1,400.00
VSS (ATG. 8b)	-	4	0	0	$15.00	$60.00
ATG. 9	12	4	2	2	$84.00	$1,680.00
ATG. 12	12	4	2	2	$26.00	$520.00
ATG. 16	12	4	2	2	$240.00	$4,800.00
ATG. 17	12	4	2	2	$177.00	$3,540.00
ATG. 19	12	4	2	2	$428.00	$8,560.00
ATG. 20	12	4	2	2	$246.00	$4,920.00
ATG. 23	12	4	2	2	$232.00	$4,640.00
ATG. 26	12	4	2	2	$133.00	$2,660.00
Toxicity Test	12	0	0	0	$600.00	$7,200.00
ATG. 24	2	0	0	0	$1,228.00	$2,456.00
ATG. 27	2	0	0	0	$104.00	$208.00
Open Characterization	2	0	0	0	$550.00	$1,100.00

TOTAL COST $100,453.00

TABLE 8 (cont)

Cost of Analysis per Effluent Stream

COST OF ANALYSIS FOR A SULFITE/MECHANICAL MILL PROCESS STREAM WITHOUT BIOLOGICAL TREATMENT AND USES BLEACHED PULP

TEST	ROUT		QA/Qc		COST/TEST	COST
	MON	Dup.	TB	TSB		
DOC/COD	365	12	0	0	$30.00	$11,310.00
pH (ATG. 3)	365	12	0	0	$7.00	$2,639.00
Conductance (ATG. 7)	365	12	0	0	$9.00	$3,393.00
TSS (ATG. 8a)	365	12	0	0	$15.00	$5,655.00
BOD5	156	12	0	0	$25.00	$4,200.00
DHA & DCDHA (ATG. 26)	144	8	4	4	$133.00	$21,280.00
Al & Zn (ATG. 9)	40	0	0	0	$84.00	$3,360.00
ATG. 4a & 4b	12	4	0	0	$87.00	$1,392.00
ATG. 6	12	4	0	0	$25.00	$400.00
ATG. 9	12	4	2	2	$84.00	$1,680.00
ATG. 12	12	4	2	2	$26.00	$520.00
ATG. 16	12	4	2	2	$240.00	$4,800.00
ATG. 17	12	4	2	2	$177.00	$3,540.00
ATG. 19	12	4	2	2	$428.00	$8,560.00
ATG. 20	12	4	2	2	$246.00	$4,920.00
ATG. 23	12	4	2	2	$232.00	$4,640.00
ATG. 26	12	4	2	2	$133.00	$2,660.00
Toxicity Test	12	0	0	0	$600.00	$7,200.00
ATG. 24	6	2	1	0	$1,228.00	$11,052.00
ATG. 27	2	0	0	0	$104.00	$208.00
Open Characterization	2	0	0	0	$550.00	$1,100.00

TOTAL COST $104,509.00

TABLE 8 (cont)

Cost of Analysis per Effluent Stream

COST OF ANALYSIS FOR A SULFITE/MECHANICAL MILL PROCESS STREAM WITHOUT BIOLOGICAL TREATMENT AND THE MILL DOES NOT MANUFACTURE OR USE BLEACHED PULP

TEST		ROUT		QA/Qc		COST/TEST	COST
		MON	Dup.	TB	TSB		
DOC/COD		365	12	0	0	$30.00	$11,310.00
pH	(ATG. 3)	365	12	0	0	$7.00	$2,639.00
Conductance	(ATG. 7)	365	12	0	0	$9.00	$3,393.00
TSS	(ATG. 8a)	365	12	0	0	$15.00	$5,655.00
BOD5		156	12	0	0	$25.00	$4,200.00
DHA & DCDHA	(ATG. 26)	144	8	4	4	$133.00	$21,280.00
Al & Zn	(ATG. 9)	40	0	0	0	$84.00	$3,360.00
ATG. 4a & 4b		12	4	0	0	$87.00	$1,392.00
ATG. 6		12	4	0	0	$25.00	$400.00
ATG. 9		12	4	2	2	$84.00	$1,680.00
ATG. 12		12	4	2	2	$26.00	$520.00
ATG. 16		12	4	2	2	$240.00	$4,800.00
ATG. 17		12	4	2	2	$177.00	$3,540.00
ATG. 19		12	4	2	2	$428.00	$8,560.00
ATG. 20		12	4	2	2	$246.00	$4,920.00
ATG. 23		12	4	2	2	$232.00	$4,640.00
ATG. 26		12	4	2	2	$133.00	$2,660.00
Toxicity Test		12	0	0	0	$600.00	$7,200.00
ATG. 24		2	0	0	0	$1,228.00	$2,456.00
ATG. 27		2	0	0	0	$104.00	$208.00
Open Characterization		2	0	0	0	$550.00	$1,100.00

TOTAL COST $95,913.00

TABLE 8 (cont)

Cost of Analysis per Effluent Stream

COST OF ANALYSIS FOR A SULFITE/MECHANICAL MILL PROCESS STREAM WITHOUT BIOLOGICAL TREATMENT AND USES BLEACHED PULP NO QA/QC REQUIREMENTS

TEST	ROUT		QA/Qc		COST/TEST	COST
	MON	Dup.	TB	TSB		
DOC/COD	365	0	0	0	$30.00	$10,950.00
pH (ATG. 3)	365	0	0	0	$7.00	$2,555.00
Conductance (ATG. 7)	365	0	0	0	$9.00	$3,285.00
TSS (ATG. 8a)	365	0	0	0	$15.00	$5,475.00
BOD5	156	0	0	0	$25.00	$3,900.00
DHA & DCDHA (ATG. 26)	144	0	0	0	$133.00	$19,152.00
Al & Zn (ATG. 9)	40	0	0	0	$84.00	$3,360.00
ATG. 4a & 4b	12	0	0	0	$87.00	$1,044.00
ATG. 6	12	0	0	0	$25.00	$300.00
ATG. 9	12	0	0	0	$84.00	$1,008.00
ATG. 12	12	0	0	0	$26.00	$312.00
ATG. 16	12	0	0	0	$240.00	$2,880.00
ATG. 17	12	0	0	0	$177.00	$2,124.00
ATG. 19	12	0	0	0	$428.00	$5,136.00
ATG. 20	12	0	0	0	$246.00	$2,952.00
ATG. 23	12	0	0	0	$232.00	$2,784.00
ATG. 26	12	0	0	0	$133.00	$1,596.00
Toxicity Test	12	0	0	0	$600.00	$7,200.00
ATG. 24	6	2	1	0	$1,228.00	$11,052.00
ATG. 27	2	0	0	0	$104.00	$208.00
Open Characterization	2	0	0	0	$550.00	$1,100.00

TOTAL COST $88,373.00

TABLE 8 (cont)

Cost of Analysis per Effluent Stream

COST OF ANALYSIS FOR A CORRUGATING MILL PROCESS STREAM THAT DOES NOT USE OR MANUFACTURE BLEACHED PULP

TEST	ROUT	QA/QC			COST/TEST	COST
	MON	Dup.	TB	TSB		
DOC/COD	365	12	0	0	$30.00	$11,310.00
pH (ATG. 3)	365	12	0	0	$7.00	$2,639.00
Conductance (ATG. 7)	365	12	0	0	$9.00	$3,393.00
TSS (ATG. 8a)	365	12	0	0	$15.00	$5,655.00
BOD5	156	12	0	0	$25.00	$4,200.00
DHA & DCDHA (ATG. 26)	144	8	4	4	$133.00	$21,280.00
Al & Zn (ATG. 9)	40	0	0	0	$84.00	$3,360.00
ATG. 4a & 4b	12	4	0	0	$87.00	$1,392.00
ATG. 6	12	4	0	0	$25.00	$400.00
ATG. 9	12	4	2	2	$84.00	$1,680.00
ATG. 12	12	4	2	2	$26.00	$520.00
ATG. 16	12	4	2	2	$240.00	$4,800.00
ATG. 17	12	4	2	2	$177.00	$3,540.00
ATG. 19	12	4	2	2	$428.00	$8,560.00
ATG. 20	12	4	2	2	$246.00	$4,920.00
ATG. 23	12	4	2	2	$232.00	$4,640.00
ATG. 26	12	4	2	2	$133.00	$2,660.00
Toxicity Test	12	0	0	0	$600.00	$7,200.00
ATG. 24	2	0	0	0	$1,228.00	$2,456.00
ATG. 27	2	0	0	0	$104.00	$208.00
Open Characterization	2	0	0	0	$550.00	$1,100.00
					TOTAL COST	$95,913.00

TABLE 8 (cont)

Cost of Analysis per Effluent Stream

COST OF ANALYSIS FOR A CORRUGATING MILL PROCESS STREAM THAT DOES NOT USE OR MANUFACTURE BLEACHED PULP NO QA/QC REQUIREMENTS

TEST		ROUT	QA/QC			COST/TEST	COST
		MON	Dup.	TB	TSB		
DOC/COD		365	0	0	0	$30.00	$10,950.00
pH	(ATG. 3)	365	0	0	0	$7.00	$2,555.00
Conductance	(ATG. 7)	365	0	0	0	$9.00	$3,285.00
TSS	(ATG. 8a)	365	0	0	0	$15.00	$5,475.00
BOD5		156	0	0	0	$25.00	$3,900.00
DHA & DCDHA	(ATG. 26)	144	0	0	0	$133.00	$19,152.00
Al & Zn	(ATG. 9)	40	0	0	0	$84.00	$3,360.00
ATG. 4a & 4b		12	0	0	0	$87.00	$1,044.00
ATG. 6		12	0	0	0	$25.00	$300.00
ATG. 9		12	0	0	0	$84.00	$1,008.00
ATG. 12		12	0	0	0	$26.00	$312.00
ATG. 16		12	0	0	0	$240.00	$2,880.00
ATG. 17		12	0	0	0	$177.00	$2,124.00
ATG. 19		12	0	0	0	$428.00	$5,136.00
ATG. 20		12	0	0	0	$246.00	$2,952.00
ATG. 23		12	0	0	0	$232.00	$2,784.00
ATG. 26		12	0	0	0	$133.00	$1,596.00
Toxicity Test		12	0	0	0	$600.00	$7,200.00
ATG. 24		2	0	0	0	$1,228.00	$2,456.00
ATG. 27		2	0	0	0	$104.00	$208.00
Open Characterization		2	0	0	0	$550.00	$1,100.00
						TOTAL COST	$79,777.00

TABLE 8 (cont)

Cost of Analysis per Effluent Stream

COST OF ANALYSIS FOR A DEINKING-BOARD-FINE PAPER-TISSUE MILL PROCESS STREAM

TEST	ROUT	QA/QC			COST/TEST	COST
	MON	Dup.	TB	TSB		
DOC/COD	365	12	0	0	$30.00	$11,310.00
pH (ATG. 3)	365	12	0	0	$7.00	$2,639.00
Conductance (ATG. 7)	365	12	0	0	$9.00	$3,393.00
TSS (ATG. 8a)	365	12	0	0	$15.00	$5,655.00
BOD5	156	12	0	0	$25.00	$4,200.00
Al & Zn (ATG. 9)	40	0	0	0	$84.00	$3,360.00
ATG. 4a & 4b	12	4	0	0	$87.00	$1,392.00
ATG. 6	12	4	0	0	$25.00	$400.00
ATG. 9	12	4	2	2	$84.00	$1,680.00
ATG. 12	12	4	2	2	$26.00	$520.00
ATG. 16	12	4	2	2	$240.00	$4,800.00
ATG. 17	12	4	2	2	$177.00	$3,540.00
ATG. 19	12	4	2	2	$428.00	$8,560.00
ATG. 20	12	4	2	2	$246.00	$4,920.00
ATG. 23	12	4	2	2	$232.00	$4,640.00
ATG. 26	12	4	2	2	$133.00	$2,660.00
Toxicity Test	12	0	0	0	$600.00	$7,200.00
ATG. 24	6	2	1	0	$1,228.00	$11,052.00
ATG. 27	2	0	0	0	$104.00	$208.00
Open Characterization	2	0	0	0	$550.00	$1,100.00

TOTAL COST $83,229.00

TABLE 8 (cont)

Cost of Analysis per Effluent Stream

COST OF ANALYSIS FOR A DEINKING-BOARD-FINE PAPER-TISSUE MILL PROCESS STREAM WHERE THE MILL DOES NOT USE BLEACHED PULP

TEST		ROUT	QA/QC			COST/TEST	COST
		MON	Dup.	TB	TSB		
DOC/COD		365	12	0	0	$30.00	$11,310.00
pH	(ATG. 3)	365	12	0	0	$7.00	$2,639.00
Conductance	(ATG. 7)	365	12	0	0	$9.00	$3,393.00
TSS	(ATG. 8a)	365	12	0	0	$15.00	$5,655.00
BOD5		156	12	0	0	$25.00	$4,200.00
Al & Zn	(ATG. 9)	40	0	0	0	$84.00	$3,360.00
ATG. 4a & 4b		12	4	0	0	$87.00	$1,392.00
ATG. 6		12	4	0	0	$25.00	$400.00
ATG. 9		12	4	2	2	$84.00	$1,680.00
ATG. 12		12	4	2	2	$26.00	$520.00
ATG. 16		12	4	2	2	$240.00	$4,800.00
ATG. 17		12	4	2	2	$177.00	$3,540.00
ATG. 19		12	4	2	2	$428.00	$8,560.00
ATG. 20		12	4	2	2	$246.00	$4,920.00
ATG. 23		12	4	2	2	$232.00	$4,640.00
ATG. 26		12	4	2	2	$133.00	$2,660.00
Toxicity Test		12	0	0	0	$600.00	$7,200.00
ATG. 24		2	0	0	0	$1,228.00	$2,456.00
ATG 27		2	0	0	0	$104.00	$208.00
Open Characterization		2	0	0	0	$550.00	$1,100.00
						TOTAL COST	$74,633.00

TABLE 8 (cont)

Cost of Analysis per Effluent Stream

COST OF ANALYSIS FOR A DEINKING/BOARD/FINE PAPER/TISSUE MILL PROCESS STREAM WITH BIOLOGICAL TREATMENT USING CHLORINE OR CHLORINE DERIVATIVES FOR THE BRIGHTENING OF FIBRE

TEST	ROUT	QA/QC			COST/TEST	COST
	MON	Dup.	TB	TSB		
DOC/COD	365	12	0	0	$30.00	$11,310.00
pH (ATG. 3)	365	12	0	0	$7.00	$2,639.00
Conductance (ATG. 7)	365	12	0	0	$9.00	$3,393.00
TSS (ATG. 8a)	365	12	0	0	$15.00	$5,655.00
BOD5	156	12	0	0	$25.00	$4,200.00
Al & Zn (ATG. 9)	40	0	0	0	$84.00	$3,360.00
ATG. 4a & 4b	52	4	0	0	$87.00	$4,872.00
ATG. 6	52	4	0	0	$25.00	$1,400.00
VSS (ATG. 8b)	-	4	0	0	$15.00	$60.00
ATG. 9	12	4	2	2	$84.00	$1,680.00
ATG. 12	12	4	2	2	$26.00	$520.00
ATG. 16	12	4	2	2	$240.00	$4,800.00
ATG. 17	12	4	2	2	$177.00	$3,540.00
ATG. 19	12	4	2	2	$428.00	$8,560.00
ATG. 20	12	4	2	2	$246.00	$4,920.00
ATG. 23	12	4	2	2	$232.00	$4,640.00
ATG. 24	12	4	2	0	$1,228.00	$22,104.00
ATG. 26	12	4	2	2	$133.00	$2,660.00
AOX	12	4	0	0	$250.00	$4,000.00
Toxicity Test	12	0	0	0	$600.00	$7,200.00
ATG. 27	2	0	0	0	$104.00	$208.00
Open Characterization	2	0	0	0	$550.00	$1,100.00

TOTAL COST $102,821.00

TABLE 8 (cont)

Cost of Analysis per Effluent Stream

COST OF ANALYSIS FOR A COOLING WATER EFFLUENT

TEST		FREQ	COST/TEST	COST
DOC/COD		12	$30.00	$360.00
pH	(ATG. 3)	12	$7.00	$84.00
Spec. Conduct	(ATG. 7)	12	$9.00	$108.00
TSS	(ATG. 8a)	12	$15.00	$180.00
Cr/Zn	(ATG. 9)	12	$84.00	$1,008.00
Toxicity Test		12	$600.00	$7,200.00

TOTAL COST $8,940.00

COST OF ANALYSIS FOR A WASTE DISPOSAL SITE EFFLUENT

TEST		FREQ	COST/TEST	COST
BOD5		12	$25.00	$300.00
pH	(ATG. 3)	12	$7.00	$84.00
ATG. 4a		12	$87.00	$1,044.00
ATG. 6		12	$25.00	$300.00
TSS	(ATG. 8a)	12	$15.00	$180.00
ATG. 9		12	$84.00	$1,008.00
ATG. 12		12	$26.00	$312.00
ATG. 20		12	$246.00	$2,952.00
ATG. 26		12	$133.00	$1,596.00

TOTAL COST $7,776.00

TABLE 8 (cont)

Cost of Analysis per Effluent Stream

COST OF ANALYSIS FOR A BACKWASH EFFLUENT

TEST		FREQ	COST/TEST	COST
DOC/COD		12	$30.00	$360.00
pH	(ATG. 3)	12	$7.00	$84.00
TSS	(ATG. 8a)	12	$15.00	$180.00
Al	(ATG. 9)	12	$84.00	$1,008.00

TOTAL COST $1,632.00

COST OF ANALYSIS FOR AN EMERGENCY OVERFLOW EFFLUENT

TEST		FREQ	COST/TEST	COST
DOC/COD		1	$30.00	$30.00
pH	(ATG. 3)	1	$7.00	$7.00
Spec. Conduct	(ATG. 7)	1	$9.00	$9.00
TSS	(ATG. 8a)	1	$15.00	$15.00

TOTAL COST $61.00

TABLE 8 (cont)

Cost of Analysis per Effluent Stream

COST OF ANALYSIS FOR STORM WATER EFFLUENTS

Bark Storage Pile

TEST	FREQ	COST/TEST	COST
BOD5	2	$25.00	$50.00
pH (ATG. 3)	2	$7.00	$14.00
TSS (ATG 8a)	2	$15.00	$30.00
ATG 20	2	$246.00	$492.00
ATG 26	2	$133.00	$266.00

TOTAL COST $852.00

Bulk Storage and Unloading Area

TEST	FREQ	COST/TEST	COST
DOC/COD	2	$30.00	$60.00
pH (ATG. 3)	2	$7.00	$14.00
Spec. Conduct	2	$9.00	$18.00
TSS (ATG 8a)	2	$15.00	$30.00

TOTAL COST $122.00

Chip Storage Pile

TEST	FREQ	COST/TEST	COST
BOD5	2	$25.00	$50.00
pH (ATG. 3)	2	$7.00	$14.00
TSS (ATG 8a)	2	$15.00	$30.00
ATG 20	2	$246.00	$492.00
ATG 26	2	$133.00	$266.00

TOTAL COST $852.00

Coal Storage Pile

TEST	FREQ	COST/TEST	COST
DOC/COD	2	$30.00	$60.00
pH (ATG. 3)	2	$7.00	$14.00
ATG. 4a	2	$87.00	$174.00
Spec. Conduct	2	$9.00	$18.00
TSS (ATG 8a)	2	$15.00	$30.00
ATG 9	2	$84.00	$168.00
ATG 12	2	$26.00	$52.00
ATG 19	2	$428.00	$856.00

TOTAL COST $1,372.00

TABLE 8 (cont)

Cost of Analysis per Effluent Stream

COST OF ANALYSIS FOR STORM WATER EFFLUENTS (cont)

Waste Disposal Site

TEST	FREQ	COST/TEST	COST
DOC/COD	2	$30.00	$60.00
pH (ATG. 3)	2	$7.00	$14.00
Spec. Conduct	2	$9.00	$18.00
TSS (ATG 8a)	2	$15.00	$30.00
ATG 9	2	$84.00	$168.00
ATG 12	2	$26.00	$52.00
ATG 20	2	$246.00	$492.00
ATG 26	2	$133.00	$266.00

TOTAL COST $1,100.00

Waste Paper Storage

TEST	FREQ	COST/TEST	COST
BOD5	2	$25.00	$50.00
pH (ATG. 3)	2	$7.00	$14.00
TSS (ATG 8a)	2	$15.00	$30.00
ATG 20	2	$246.00	$492.00

TOTAL COST $586.00

Wood Storage

TEST	FREQ	COST/TEST	COST
BOD5	2	$25.00	$50.00
pH (ATG. 3)	2	$7.00	$14.00
TSS (ATG 8a)	2	$15.00	$30.00
ATG 20	2	$246.00	$492.00
ATG 26	2	$133.00	$266.00

TOTAL COST $852.00

PART III

THE EFFLUENT MONITORING REGULATION FOR THE PULP AND PAPER SECTOR.

ONTARIO REGULATION 435/89

under the Environmental Protection Act

EFFLUENT MONITORING - PULP AND PAPER SECTOR

REGULATION MADE UNDER THE
ENVIRONMENTAL PROTECTION ACT

EFFLUENT MONITORING - PULP AND PAPER SECTOR

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O. Reg. No. 435/89
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REGULATION MADE UNDER THE ENVIRONMENTAL PROTECTION ACT

EFFLUENT MONITORING - PULP AND PAPER SECTOR

Definitions

1.-(1) In this Regulation,

"backwash effluent" means effluent discharged from an intake water treatment operation but does not include effluent discharged from intake water screening operations;

"backwash effluent stream" means backwash effluent that flows through an open or closed channel that discharges directly to a surface watercourse;

"backwash effluent sampling point" means a location in a backwash effluent stream where samples of backwash effluent are collected;

"biologically treated effluent" means effluent discharged from a biological treatment process;

"bleached pulp" means fibre that has been bleached or brightened using chlorine or chlorine derivatives;

"catchment area" means an area of land within a plant that is indicated as a catchment area in the report prepared by Beak Consultants Limited for the Ontario Ministry of the Environment, entitled "A Survey of Stormwater Runoff at Ontario Pulp and Paper Mills" and dated 1988;

"cooling water effluent stream" means cooling water that flows through an open or closed channel that discharges directly to a surface watercourse;

"cooling water sampling point" means a location in a cooling water effluent stream where samples of cooling water are collected;

"effluent" means liquid and associated material;

"effluent stream" means effluent that flows through an open or closed channel that discharges to a surface watercourse;

"emergency overflow" means,

(a) effluent that, because of circumstances that are not routine, does not pass through the sampling point that would otherwise be used under this Regulation for that effluent, and

(b) effluent that would not be discharged from a plant to a surface watercourse under normal operating conditions in the plant;

"emergency overflow effluent stream" means emergency overflow that flows through an open or closed channel that discharges directly to a surface watercourse;

"emergency overflow effluent sampling point" means a location in an emergency overflow effluent stream where samples of emergency overflow are collected;

"General Effluent Monitoring Regulation" means Ontario Regulation 695/88;

"grab sample" means a volume of effluent of at least 100 millilitres that is collected over a period not exceeding fifteen minutes and transferred as soon as is practicable to the appropriate laboratory sample container as set out in column 2 of Schedule 2 to the General Effluent Monitoring Regulation and in column 2 of Schedule 1 to this Regulation;

"open characterization" means the analysis of a sample to search for and, where present, to identify and to determine the approximate quantity of each of the parameters in analytical test groups 28a and 28b as set out in Schedule L;

"operating day" in relation to a direct discharger's plant, means a twenty-four hour period during which the plant is in operation, beginning at a time specified by the direct discharger in the initial report;

"plant" means,

(a) the developed property on which a mill that manufactures pulp or paper products is located,

(b) all buildings, equipment, operations and processes, including waste disposal facilities, on the property, and

(c) all wastewater treatment facilities associated with the mill;

"process change" means a change in equipment, production processes, treatment processes or waste disposal operations;

"process effluent sampling point" means a location in a process effluent stream where samples of process effluent are collected;

"process effluent stream" means process effluent that flows through an open or closed channel that discharges directly to a surface watercourse;

"sample" means a collected volume of liquid and associated material and includes a combined sample, a composite sample or a grab sample;

"sampling point" means a location in a stream at which a sample is collected;

"semi-annually" means once in each six month period beginning on the 1st day of January, 1990 and once in each six month period beginning on the 1st day of July, 1990;

"storm water effluent stream" means storm water that flows through an open or closed channel that discharges directly to a surface watercourse;

"stream" means liquid and associated material that flows through an open or closed channel;

"travelling blank sample" means a quality control sample prepared in accordance with subsections 23(1) and (2);

"travelling spiked blank sample" means a quality control sample prepared in accordance with subsection 23(3);

"waste disposal site effluent" means effluent discharged from any waste disposal site other than a waste disposal site used solely for the storage, for use as fuel, of wood wastes, bark or both;

"waste disposal site effluent sampling point" means a location in a waste disposal site effluent stream where samples of waste disposal site effluent are collected;

"waste disposal site effluent stream" means waste disposal site effluent that flows through an open or closed channel that discharges directly to a surface watercourse;

(2) The definitions in section 1 of the General Effluent Monitoring Regulation that are not redefined in this Regulation apply to this Regulation.

(3) Where a term is defined in this Regulation and in the General Effluent Monitoring Regulation, the definition in this Regulation applies to the General Effluent Monitoring Regulation insofar as that Regulation governs direct dischargers to which this Regulation applies.

(4) A reference in this Regulation or the Schedules to parameters in an analytical test group is a reference to parameters in that analytical test group as indicated in Schedule L.

Purpose

2. The purpose of this Regulation is to establish a data base on effluent quality in the Pulp and Paper Sector that, along with other pertinent information, will be used in the development of effluent limits for that sector.

Application

3.-(1) This Regulation applies only with respect to the plants listed in subsection (2) and only with respect to streams on which sampling points are established under section 6.

(2) For the purposes of this Regulation, the plants with respect to which this Regulation applies are divided into categories as set out in the following Table:

TABLE

Item	Plant	Location	Owner as of June 15, 1989
SULPHATE (KRAFT) CATEGORY			
1	Boise Cascade	Fort Frances	Boise Cascade Canada Ltd.
2	Canadian Pacific Forest Products	Dryden	Canadian Pacific Forest Products Limited
3	Canadian Pacific Forest Products	Thunder Bay	Canadian Pacific Forest Products Limited
4	Domtar	Cornwall	Domtar Inc., Fine Papers Division
5	Domtar	Red Rock	Domtar Inc., Containerboard Division
6	Eddy Forest Products	Espanola	E.B. Eddy Forest Products Ltd.
7	James River	Marathon	James River-Marathon Ltd.
8	Kimberly-Clark	Terrace Bay	Kimberly-Clark of Canada Ltd.
9	Malette	Smooth Rock Falls	Malette Inc., Malette Kraft Pulp and Power Division
SULPHITE-MECHANICAL CATEGORY			
10	Abitibi-Price Thunder Bay Mill	Thunder Bay	Abitibi-Price Inc., Thunder Bay Division
11	Abitibi-Price Fort William Mill	Thunder Bay	Abitibi-Price Inc., Fort William Division
12	Abitibi-Price Port Arthur Mill	Thunder Bay	Abitibi-Price Inc., Fine Paper Division

13	Abitibi	Iroquois Falls	Abitibi-Price Inc., Iroquois Falls Division
14	Boise Cascade	Kenora	Boise Cascade Canada Ltd.
15	Quebec & Ontario Paper	Thorold	Q & O Paper Company Ltd.
16	St. Marys Paper	Sault Ste. Marie	St. Marys Paper Inc.
17	Spruce Falls	Kapuskasing	Spruce Falls Power and Paper Company, Limited

CORRUGATING CATEGORY

18	Domtar	Trenton	Domtar Inc., Containerboard Division
19	MacMillan-Bloedel	Sturgeon Falls	MacMillan Bloedel Limited

DEINKING-BOARD-FINE PAPERS-TISSUE CATEGORY

20	Beaver Wood Fibre	Thorold	Beaver Wood Fibre Company, Limited
21	Domtar Fine Papers	St. Catharines	Domtar Inc., Fine Paper Division
22	Eddy Forest Products	Ottawa	E.B. Eddy Forest Products Ltd.
23	Fraser	Thorold	Noranda Forest Inc.
24	Kimberly-Clark	St. Catharines	Kimberly-Clark of Canada Limited
25	Kimberly-Clark	Huntsville	Kimberly-Clark of Canada Limited
26	Trent Valley	Trenton	Paperboard Industries Corporation, Trent Valley Paperboard Mills Division
27	Strathcona	Napanee	Roman Corporation Limited

(3) This Regulation is a Sectoral Effluent Monitoring Regulation within the meaning of the General Effluent Monitoring Regulation.

(4) An obligation on a direct discharger to do a thing under this Regulation is discharged if another person has done it on the direct discharger's behalf.

Combined Sampling

4.-(1) A direct discharger who, by the 1st day of November, 1989, satisfies the Director that it would be unduly difficult to collect samples from a process effluent stream, may, instead of collecting a set of samples from that process effluent stream as otherwise required by this Regulation, collect composite samples from each of the streams that combine to make up that process effluent stream, combine those composite samples in proportion to flow and collect a set of samples from that combination, referred to in this section and in subsection 6(2) as a set of combined samples.

(2) A direct discharger who collects a set of combined samples in accordance with subsection (1) instead of collecting a set of samples from a process effluent stream shall analyze the set of combined samples as if it were the set of samples from the process effluent stream.

(3) The General Effluent Monitoring Regulation applies in relation to streams from which composite samples are collected under subsection (1) as if those streams were process effluent streams, and in relation to sampling points on streams from which composite samples are collected under subsection (1) as if those sampling points were process effluent sampling points.

Monitoring Principles

5.-(1) Each direct discharger shall carry out the monitoring obligations of this Regulation, including the sampling, analysis, toxicity testing, flow measurement, recording and reporting obligations of this Regulation, in accordance with the General Effluent Monitoring Regulation.

(2) Each direct discharger shall carry out the sampling and analytical obligations in relation to samples to be analyzed for parameters in analytical test groups 26, PP1, PP2 and PP3 in accordance with Schedules 1 and 2.

(3) Instead of the minimum sample volumes set out in Column 5 of Schedule 2 to the General Effluent Monitoring Regulation and in Column 5 of Schedule 1 to this Regulation, a direct discharger may submit to a laboratory analyzing samples under this Regulation the minimum sample volumes required by that laboratory to meet the analytical method detection limits set out in column 6 of Schedule 3 to the General Effluent Monitoring Regulation and in Column 6 of Schedule 2 to this Regulation.

(4) Where a direct discharger is required to collect a set of samples, the discharger shall collect the number of samples needed to perform all of the analyses required in relation to that set of samples.

Sampling Points

6.-(1) Each direct discharger shall, by the 1st day of November, 1989, establish a sampling point on each effluent stream of that discharger as follows:

1. A backwash effluent sampling point on each backwash effluent stream.

2. A cooling water sampling point on each cooling water effluent stream.

3. A process effluent sampling point on each process effluent stream.

4. A storm water sampling point on each storm water effluent stream that drains a catchment area with one or more of the following uses:

i) Bark storage.

ii) Bulk storage and unloading.

iii) Chip storage.

iv) Coal storage.

v) Waste disposal.

vi) Waste paper storage.

vii) Wood storage.

5. A waste disposal site effluent sampling point on each waste disposal site effluent stream that drains a waste disposal site that regularly discharges waste disposal site effluent.

6. An emergency overflow effluent sampling point on each emergency overflow effluent stream.

(2) A direct discharger who collects sets of combined samples in accordance with subsection 4(1) instead of collecting sets of samples from a process effluent stream shall, by the 1st day of November, 1989, establish a sampling point on each of the streams that combine to make up that process effluent stream, and, despite paragraph 3 of subsection (1), need not establish a sampling point on that process effluent stream.

(3) A direct discharger who has more than one catchment area with a land use of bark storage may, by the 1st day of November, 1989, instead of establishing sampling points on storm water effluent streams originating from each such catchment area as required by paragraph 4 of subsection (1), establish sampling points only on storm water effluent streams originating from the largest of them.

(4) Subsection (3) applies with necessary modifications where a direct discharger has more than one catchment area with a land use of chip storage, where a direct discharger has more than one catchment area with a land use of waste paper storage, and where a direct discharger has more than one catchment area with a land use of wood storage.

(5) A waste disposal site that discharges waste disposal site effluent only as a result of precipitation is not a waste disposal site that regularly discharges waste disposal site effluent within the meaning of paragraph 5 of subsection (1).

(6) Each direct discharger shall use the sampling points established under subsections (1), (2), (3) and (4) for all sampling required by this Regulation, except that a direct discharger may use alternate sampling points where that is acceptable to the Director.

(7) Each direct discharger shall collect each sample from a process effluent sampling point as a composite sample.

(8) Each direct discharger shall collect each sample required to be collected from a cooling water sampling point by one of the means described in clauses 3(4)(a), (b), (c), (d) and (e) of the General Effluent Monitoring Regulation.

(9) Each direct discharger shall collect each sample required to be collected from a backwash effluent sampling point, a storm water sampling point, an emergency overflow effluent sampling point or a waste disposal site effluent sampling point,

(a) by one of the means described in clauses 3(4)(a), (c) and (e) of the General Effluent Monitoring Regulation; or

(b) by taking one grab sample.

(10) Except as otherwise specifically provided, sets of samples required to be collected under this Regulation need not be collected on the same day.

Daily Monitoring - Process Effluent - All Categories

7.-(1) During each operating day, each direct discharger shall collect a set of samples from each process effluent sampling point of that discharger, and shall analyze each such set for the parameters indicated in the daily column of Schedule A.

(2) Subsection (1) does not apply in respect of any day on which a sufficient volume of sample cannot be collected because of the collection of inspection samples.

Thrice Weekly Monitoring - Process Effluent - All Categories

8. Each direct discharger shall collect a set of samples on three operating days in each week from each process effluent sampling point of that discharger, and shall analyze each such set for the parameters indicated in the thrice weekly column of Schedule A.

Weekly Monitoring - Process Effluent - All Categories

9.-(1) Each direct discharger shall collect a set of samples on one operating day in each week from each process effluent sampling point of that discharger, and shall analyze each such set for the parameters indicated in the weekly column of Schedule A.

(2) For the purpose of subsection (1), a set of samples collected from a sampling point after the first set of samples is collected from that point under subsection (1) shall be collected no sooner than two days after the previous sampling under subsection (1) from that sampling point.

Monthly Monitoring - Process Effluent - All Categories

10.-(1) Each direct discharger shall collect a set of samples on one operating day in each month from each process effluent sampling point of that discharger, and shall analyze each such set for the parameters indicated in the monthly column of Schedule A.

(2) For the purpose of subsection (1), a set of samples collected from a sampling point after the first set of samples is collected from that point under subsection (1) shall be collected no sooner than two weeks after the previous sampling under subsection (1) from that sampling point.

Semi-annual Monitoring - Process Effluent - All Categories

11.-(1) Each direct discharger shall collect a set of samples semi-annually from each process effluent sampling point of that discharger, and shall analyze each such set for the parameters indicated in Part A in the semi-annual column of Schedule A.

(2) Each direct discharger shall collect a set of samples semi-annually from each process effluent sampling point of that discharger, and shall analyze each such set for the parameters indicated in Part B in the semi-annual column of Schedule A.

(3) Each set of samples collected under subsections (1) and (2) shall be collected on one of the days on which a sample is collected under subsection 10(1) from the same sampling point.

(4) For the purpose of subsection (1), a set of samples collected from a sampling point after the first set of samples is collected from that point under subsection (1) shall be collected no sooner than 180 days after the previous sampling under subsection (1) from that sampling point.

(5) For the purpose of subsection (2), a set of samples collected from a sampling point after the first set of samples is collected from that point under subsection (2) shall be collected no sooner than 180 days after the previous sampling under subsection (2) from that sampling point.

(6) Each direct discharger shall collect a set of samples semi-annually from each process effluent sampling point of that discharger, and shall analyze each such set for the parameters indicated in Part C in the semi-annual column of Schedule A.

(7) For the purpose of subsection (6), a set of samples collected from a sampling point after the first set of samples is collected from that point under subsection (6) shall be collected no sooner than 180 days after the previous sampling under subsection (6) from that sampling point.

Thrice Weekly Monitoring - Process Effluent - Sulphate (Kraft) Category

12.-(1) Each direct discharger in the Sulphate (Kraft) Category shall collect a set of samples on three operating days in each week from each process effluent sampling point of that discharger, and shall analyze each such set for the parameters indicated in the thrice weekly column of Schedule B.

(2) One set of samples collected from each sampling point in each month under subsection (1) shall be collected on a day on which a sample is collected under subsection 10(1) from the same sampling point.

Monthly Monitoring - Process Effluent - Sulphate (Kraft) Category

13.-(1) Each direct discharger in the Sulphate (Kraft) Category shall collect a set of samples on one operating day in each month from each process effluent sampling point of that discharger, and shall analyze each such set for the parameters indicated in Part A in the monthly column of Schedule B.

(2) Each set of samples collected under subsection (1) shall be collected on a day on which a sample is collected under subsection 10(1) from the same sampling point.

(3) Each direct discharger in the Sulphate (Kraft) Category shall collect a set of samples on one operating day in each month from each process effluent sampling point of that discharger, and shall analyze each such set for the parameters indicated in Part B in the monthly column of Schedule B.

(4) For the purpose of subsection (3), a set of samples collected from a sampling point after the first set of samples is collected from that point under subsection (3) shall be collected no sooner than two weeks after the previous sampling under subsection (3) from that sampling point.

Thrice Weekly Monitoring - Process Effluent - Sulphite-Mechanical & Corrugating Categories

14. Each direct discharger in the Sulphite-Mechanical Category and in the Corrugating Category shall collect a set of samples on three operating days in each week from each process effluent sampling point of that discharger, and shall analyze each such set for the parameters indicated in Schedule C.

Monthly Monitoring - Process Effluent - Deinking-Board-Fine Papers-Tissue Category

15.-(1) Subject to subsection (5), each direct discharger in the Deinking-Board-Fine Papers-Tissue Category shall collect a set of samples on one operating day in each month from each process effluent sampling point of that discharger, and shall analyze each such set for the parameters indicated in Part A in Schedule D.

(2) Each set of samples collected under subsection (1) shall be collected on a day on which a sample is collected under subsection 10(1) from the same sampling point.

(3) Subject to subsection (5), each direct discharger in the Deinking-Board-Fine Papers-Tissue Category shall collect a set of samples on one operating day in each month from each process effluent sampling point of that discharger, and shall analyze each such set for the parameters indicated in Part B in Schedule D.

(4) For the purpose of subsection (3), a set of samples collected from a sampling point after the first set of samples is

collected from that point under subsection (3) shall be collected no sooner than two weeks after the previous sampling under subsection (3) from that sampling point.

(5) A direct discharger who does not use chlorine or chlorine derivatives for bleaching or brightening of fibre need not comply with from the requirements of subsections (1) and (3).

Weekly Monitoring - Process Effluent - Mills Operating Biological Treatment Processes

16.-(1) Each direct discharger shall collect a set of samples on one operating day in each week from each process effluent sampling point of that discharger through which biologically treated effluent passes, and shall analyze each such set for the parameters indicated in Schedule E.

(2) A direct discharger who does not add nitrogen compounds to any biological treatment process need not analyze the sets of samples collected under subsection (1) for the parameters in analytical test groups 4a and 4b.

(3) A direct discharger who does not add phosphorus compounds to any biological treatment process need not analyze the sets of samples collected under subsection (1) for the parameters in analytical test group 6.

(4) For the purpose of subsection (1), a set of samples collected from a sampling point after the first set of samples is collected from that point under subsection (1) shall be collected no sooner than two days after the previous sampling under subsection (1) from that sampling point.

Bi-monthly Monitoring - Process Effluent - Mills Using Bleached Pulp

17.- (1) Subject to subsection (3), each direct discharger who uses bleached pulp but does not manufacture bleached pulp shall collect a set of samples on one operating day in each two month period from each process effluent sampling point of that discharger, and shall analyze each such set for the parameters indicated in Schedule F.

(2) For the purpose of subsection (1), a set of samples collected from a sampling point after the first set of samples is collected from that point under subsection (1) shall be collected no sooner than six weeks after the previous sampling under subsection (1) from that sampling point.

(3) Each direct discharger who uses bleached pulp only intermittently, as a replacement for other kinds of pulp that are normally used in the discharger's plant, but who does not manufacture bleached pulp need not comply with subsection (1), but each such discharger shall collect a set of samples sufficient to perform the analyses required by subsection (4) from each process effluent sampling point of that discharger once in each month in which bleached pulp is used in the discharger's plant, on a day on which bleached pulp is being used in the discharger's plant.

(4) Each direct discharger shall analyze each set of samples collected under subsection (3) for the parameters indicated in Schedule F.

(5) A direct discharger need only fulfill the requirements of subsection (3) during six months in which bleached pulp is used in the discharger's plant.

Cooling Water Monitoring - All Categories

18.-(1) Each direct discharger shall collect a set of samples on one operating day in each month from each cooling water sampling point of that discharger, and shall analyze each such set for the parameters indicated in Schedule G.

(2) A direct discharger who does not add chromium salts to cooling water need not analyze the sets of samples collected under subsection (1) for the parameter chromium.

(3) A direct discharger who does not add zinc salts to cooling water need not analyze the sets of samples collected under subsection (1) for the parameter zinc.

(4) For the purpose of subsection (1), a set of samples collected from a sampling point after the first set of samples is collected from that point under subsection (1) shall be collected no sooner than two weeks after the previous sampling under subsection (1) from that sampling point.

Waste Disposal Site Effluent Monitoring - All Categories

19.-(1) Each direct discharger shall collect a set of samples on one operating day in each month from each waste disposal site effluent sampling point of that discharger, and shall analyze each such set for the parameters indicated in Schedule H.

(2) A direct discharger who does not dispose of chemical sludges at a waste disposal site within that discharger's plant need not analyze the sets of samples collected under subsection (1) for the parameters in analytical test groups 9 and 12.

(3) For the purpose of subsection (1), a set of samples collected from a sampling point after the first set of samples is collected from that point under subsection (1) shall be collected no sooner than two weeks after the previous sampling under subsection (1) from that sampling point.

Backwash Effluent Monitoring - All Categories

20.-(1) Each direct discharger shall collect a set of samples on one operating day in each month from each backwash effluent sampling point of that discharger, and shall analyze each such set for the parameters indicated in Schedule I.

(2) A direct discharger who does not add aluminum compounds to intake water need not analyze the sets of the samples collected under subsection (1) for the parameter aluminum.

(3) For the purpose of subsection (1), a set of samples collected from a sampling point after the first set of samples is collected from that point under subsection (1) shall be collected no sooner than two weeks after the previous sampling under subsection (1) from that sampling point.

Emergency Overflow Monitoring - All Categories

21.-(1) During each discharge of emergency overflow, each direct discharger shall collect a set of samples from each affected emergency overflow effluent sampling point of that discharger, and shall analyze each such set for the parameters indicated in Schedule J.

(2) Subsection (1) does not apply if the collection of samples would result in danger to health or safety.

Storm Water Monitoring - All Categories

22.-(1) Each direct discharger shall, twice during the period beginning on the 1st day of January, 1990 and ending on the 31st day of December, 1990, collect a set of samples sufficient to perform the analyses required by subsection (2) from each storm water sampling point of that discharger.

(2) Each direct discharger shall analyze each set of samples collected under subsection (1) for the parameters indicated in the land use columns in Schedule K that correspond to the land uses of the catchment area in respect of which the set of samples was collected under subsection (1).

(3) A direct discharger need not analyze a set of samples collected under subsection (1) for parameters in analytical test groups 9 and 12 if the discharger does not dispose of chemical sludges in the catchment area in respect of which the set of samples was collected.

(4) Each direct discharger shall collect each set of samples under subsection (1) on a day on which there is a storm event that affects the sampling point from which it is to be collected.

(5) For the purpose of subsection (1), a set of samples collected from a sampling point after the first set of samples is collected from that point under subsection (1) shall be collected no sooner than 90 days after the previous sampling under subsection (1) from that sampling point.

Travelling Blank and Travelling Spiked Blank Samples

23.-(1) Where a direct discharger is required by sections 24 to 26 to prepare a travelling blank sample for another sample, the discharger shall,

(a) prepare a quality control sample of uncontaminated water;

(b) ensure that the quality control sample accompanies the container intended for the other sample from the laboratory that provides the container to the area in which the other sample is to be prepared;

(c) open and reseal the quality control sample in that area; and

(d) return the quality control sample together with the other sample to the laboratory for analysis.

(2) Each direct discharger shall, after opening and before resealing a travelling blank sample under clause 1(c), preserve it according to the same methods, if any, used to preserve the other sample.

(3) Where a direct discharger is required by sections 24 and 25 to prepare a travelling spiked blank sample for another sample, the discharger shall,

(a) prepare a quality control sample of uncontaminated water to which a certain recorded quantity of standard solution has been added;

(b) preserve the quality control sample according to the same methods, if any, used to preserve the other sample;

(c) within twenty-four hours of complying with clauses (a) and (b), ensure that the quality control sample accompanies the container intended for the other sample from the laboratory that provides the container to the area in which the other sample is to be prepared; and

(d) return the quality control sample, unopened, together with the other sample to the laboratory for analysis.

(4) Each travelling spiked blank sample required to be analyzed by subsections 24(6), 24(8) and 25(8) shall be prepared with a standard solution containing at least the parameters to be analyzed for except that a travelling spiked blank sample to be analyzed for fatty and resin acids may be prepared with a standard solution of dehydroabietic acid only.

Quality Control for Daily and Thrice Weekly Monitoring

24.-(1) Once in each month, with at least two weeks between successive collections, each direct discharger shall collect, from one process effluent stream of that discharger, a duplicate sample for each sample in a set of samples collected under subsection 7(1), and shall analyze the set of duplicate samples for the parameters in the daily column of Schedule A.

(2) Once in each month, with at least two weeks between successive collections, each direct discharger shall collect, from one process effluent stream of that discharger, a duplicate sample for each sample in a set of samples collected under section 8, and shall analyze the set of duplicate samples for the parameters indicated in the thrice weekly column of Schedule A.

(3) Once in each month, with at least two weeks between successive collections, each direct discharger in the Sulphate (Kraft) Category shall collect, from one process effluent

sampling point of that discharger, a duplicate sample for each sample in a set of samples collected under subsection 12(1), and shall analyze the set of duplicate samples for the parameters indicated in the thrice weekly column of Schedule B.

(4) Once in each month, with at least two weeks between successive collections, each direct discharger in the Sulphite-Mechanical Category and in the Corrugating Category shall collect, from one process effluent sampling point of that discharger, a duplicate sample for each sample in a set of samples collected under section 14 and shall analyze the set of duplicate samples for the parameters indicated in Schedule C.

(5) Once in each two month period, each direct discharger in the Sulphate (Kraft) Category shall prepare a travelling blank sample and a travelling spiked blank sample for each sample in a set of samples collected under subsection 12(1) in respect of which duplicate samples are collected under subsection (3).

(6) Each direct discharger shall analyze each set of travelling blank samples and each set of travelling spiked blank samples prepared under subsection (5) for dichlorodehydroabietic acid and dehydroabietic acid.

(7) Once in each two month period, each direct discharger in the Sulphite-Mechanical Category and in the Corrugating Category shall prepare a travelling blank sample and a travelling spiked blank sample for each sample in a set of samples collected under section 14 in respect of which duplicate samples are collected under subsection (4).

(8) Each direct discharger shall analyze each set of travelling blank samples and each set of travelling spiked blank samples prepared under subsection (7) for dehydroabietic acid.

Quality Control For Weekly and Monthly Monitoring

25.-(1) Once in each quarter, with at least six weeks between successive collections, each direct discharger who collects samples under subsection 16(1) shall collect, from one process effluent sampling point of that discharger through which biologically treated effluent passes, a duplicate sample for each sample in a set of samples collected under subsection 16(1) and shall analyze the set of duplicate samples for the parameter volatile suspended solids (VSS) in analytical test group 8.

(2) Once in each quarter, with at least six weeks between successive collections, each direct discharger shall collect, from one process effluent sampling point of that discharger, a

duplicate sample for each sample in a set of samples collected under subsection 10(1) and shall analyze the set of duplicate samples for the parameters indicated in monthly column of Schedule A.

(3) Once in each quarter, with at least six weeks between successive collections, each direct discharger in the Sulphate (Kraft) Category shall collect, from one process effluent sampling point of that discharger, a duplicate sample for each sample in a set of samples collected under subsection 13(1), and shall analyze the set of duplicate samples for the parameters indicated in Part A in the monthly column of Schedule B.

(4) Once in each quarter, with at least six weeks between successive collections, each direct discharger in the Sulphate (Kraft) Category shall collect, from one process effluent sampling point of that discharger, a duplicate sample for each sample in a set of samples collected under subsection 13(3), and shall analyze the set of duplicate samples for the parameters indicated in Part B in the monthly column of Schedule B.

(5) Once in each quarter, with at least six weeks between successive collections, each direct discharger in the Deinking-Board-Fine Papers-Tissue Category who collects samples under subsection 15(1) shall collect, from one process effluent sampling point of that discharger, a duplicate sample for each sample in a set of samples collected under subsection 15(1), and shall analyze the set of duplicate samples for the parameters indicated in Part A in Schedule D.

(6) Once in each quarter, with at least six weeks between successive collections, each direct discharger in the Deinking-Board-Fine Papers-Tissue Category who collects samples under subsection 15(3) shall collect, from one process effluent sampling point of that discharger, a duplicate sample for each sample in a set of samples collected under subsection 15(3), and shall analyze the set of duplicate samples for the parameters indicated in Part B in Schedule D.

(7) Semi-annually, each direct discharger shall prepare a travelling blank sample and a travelling spiked blank sample for each sample in a set of samples collected under subsection 10(1) in respect of which duplicate samples are collected under subsection (2).

(8) Each direct discharger shall analyze each set of travelling blank samples and each set of travelling spiked blank samples prepared under subsection (7) for the parameters indicated in the monthly column of Schedule A, excluding the parameters in analytical test groups 4a, 4b and 6.

(9) Semi-annually, each direct discharger in the Sulphate (Kraft) Category shall prepare a travelling blank sample for each sample in a set of samples collected under subsection 13(3) in respect of which duplicate samples are collected under subsection (4), and shall analyze the set of travelling blank samples for the parameters indicated in Part B in the monthly column of Schedule B.

(10) Semi-annually, each direct discharger in the Deinking-Board-Fine Papers-Tissue Category who collects duplicate samples under subsection (6) shall prepare a travelling blank sample for each sample in a set of samples collected under subsection 15(3) in respect of which duplicate samples are collected under subsection (6), and shall analyze the set of travelling blank samples for the parameters indicated in Part B in Schedule D.

Quality Control For Bi-Monthly Monitoring

26.-(1) Semi-annually, each direct discharger who collects samples under subsection 17(1) shall collect, from one process effluent sampling point of that discharger, a duplicate sample for each sample in a set of samples collected under subsection 17(1), and shall analyze the set of duplicate samples for the parameters indicated in Schedule F.

(2) Each direct discharger shall prepare a travelling blank sample for each sample in the set of samples collected under subsection 17(1) in respect of which the second set of duplicate samples is collected under subsection (1), and shall analyze the set of travelling blank samples for the parameters indicated in Schedule F.

Toxicity Testing

27.-(1) Each direct discharger shall collect a sample from each process effluent sampling point of that discharger once in each month, on the same day as a set of samples is collected under subsection 10(1) from that sampling point, and shall perform a fish toxicity test and a Daphnia magna acute lethality toxicity test on each such sample.

(2) If the fish toxicity tests performed by a direct discharger under subsection (1) on all samples from a sampling point in three consecutive months result in mortality for no more than five out of ten fish at each effluent concentration, the

discharger need not perform monthly fish toxicity tests under subsection (1) on samples from that sampling point.

(3) Each direct discharger shall collect a sample from each sampling point of that discharger in respect of which subsection (2) applies once in each quarter, on the same day as a set of samples is collected under subsection 10(1) from that sampling point, and shall perform a fish toxicity test on each such sample.

(4) If a fish toxicity test performed under subsection (3) on any sample from a sampling point results in mortality for more than five out of ten fish, subsections (2) and (3) cease to apply and continue not to apply in respect of samples from that sampling point until the fish toxicity tests performed under subsection (1) on all samples from that sampling point in a further three consecutive months result in mortality for no more than five out of ten fish at each effluent concentration.

(5) Each direct discharger shall collect a sample from each cooling water sampling point of that discharger once in each month, on the same day as a set of samples is collected under subsection 18(1) from that sampling point, and shall perform a fish toxicity test and Daphnia magna acute lethality toxicity test on each such sample.

(6) If the fish toxicity tests performed by a direct discharger under subsection (5) on all samples from a sampling point in three consecutive months result in mortality for no more than five out of ten fish at each effluent concentration, the discharger need not perform monthly fish toxicity tests under subsection (5) on samples from that sampling point.

(7) Each direct discharger shall collect a sample from each sampling point of that discharger in respect of which subsection (6) applies once in each quarter, on the same day as a set of samples is collected from that sampling point under subsection 18(1), and shall perform a fish toxicity test on each such sample in its undiluted form only.

(8) If a fish toxicity test performed under subsection (7) on any sample from a sampling point results in mortality for more than five out of ten fish, subsections (6) and (7) cease to apply and continue not to apply in respect of samples from that sampling point until the fish toxicity tests performed under subsection (5) on all samples from that sampling point in a further three consecutive months result in mortality for no more than five out of ten fish at each effluent concentration.

Flow Measurement

28.-(1) Each direct discharger shall continuously measure and record the flow of each process effluent stream of that discharger.

(2) Subject to subsection (3), each direct discharger shall demonstrate by calibration, performed no earlier than 365 days before the filing of this Regulation and no later than thirty days before the first use of the device for the purposes of this Regulation, that each primary flow measuring device to be used to measure the flow of a process effluent stream for the purposes of this Regulation meets the accuracy requirement of subsection 6(1) of the General Effluent Monitoring Regulation.

(3) Where a direct discharger demonstrates to the Director by means of a certified report of a registered professional engineer of the Province of Ontario, that a primary flow measuring device to be used to measure the flow of a process effluent stream has been designed and installed in accordance with the standards of a national or international standards setting organization, that primary device will be deemed to have met the accuracy requirement of subsection 6(1) of the General Effluent Monitoring Regulation.

(4) Where the flow of a process effluent stream cannot be continuously measured on any operating day because of equipment malfunction and all reasonable care has been taken to avoid and correct the malfunction, the direct discharger may fulfill the continuous flow measurement requirements of subsection (1) by estimating, in accordance with generally accepted engineering principles, the total volume of effluent discharged on that day from that stream and recording that estimate.

(5) On each operating day, each direct discharger shall, using generally accepted engineering principles, measure or estimate the flow of each cooling water effluent stream and waste disposal site effluent stream from which the discharger collects samples under this Regulation and shall record the measured or estimated data.

(6) Each direct discharger shall use methods, devices and calculations for the measurement or estimation of the flow of a cooling water effluent stream that are capable of accuracy to within plus or minus 20 per cent of the actual flow.

(7) Each direct discharger shall, using generally accepted engineering principles, estimate the volume of each discharge of storm water and backwash effluent in respect of which the

discharger has taken a sample under this Regulation, and shall record the duration and estimated volume of each such discharge.

(8) Each direct discharger shall, using generally accepted engineering principles, measure or estimate the volume of each discharge of emergency overflow in respect of which the discharger has taken a sample under this Regulation and shall record the location, duration and measured or estimated volume of each such discharge.

(9) Subsection 6(6) of the General Effluent Monitoring Regulation does not apply in respect of measurements or estimates of the volume of discharges of storm water and waste disposal site effluent.

(10) Where a direct discharger measures or estimates the flow of a stream or the volume of effluent discharged from a stream under this section, the discharger shall do so at a location or set of locations that will yield results representative of the flow at the sampling point established under section 6 for that stream.

(11) Subsection (10) does not apply in respect of estimates of the volume of discharges of storm water.

Reporting Requirements

29.-(1) Each direct discharger shall, by the 1st day of November, 1989, submit an initial report to the Director in respect of that discharger's plant.

(2) In addition to meeting the requirements of subsection 7(1) of the General Effluent Monitoring Regulation, each direct discharger shall include the following information in the initial report:

1. A mill identification code number and a name or description for,
    - (a) each stream on which the discharger establishes a sampling point under section 6;
    - (b) each sampling point established under section 6; and
    - (c) each location at which a flow or a volume of discharge is to be measured or estimated under this Regulation.

2. A statement showing the sampling point to which each location at which a flow or a volume of discharge is to be measured or estimated under this Regulation corresponds.

3. One or more plot plans, along with supporting text, showing the location of each catchment area within the discharger's plant, the land uses of those areas, the storm water effluent streams that drain those areas, the sampling points established on those streams and the points at which those streams discharge from the plant.

4. The time at which an operating day begins in the discharger's plant.

(3) Each direct discharger shall include in the initial report a statement of the types and quantities of chemicals added to each cooling water effluent stream of that discharger, together with the dates on which the chemicals were added to each stream, in the period beginning on the 1st day of September, 1988 and ending on the 30th day of September, 1989, to the extent that the discharger's records permit the compilation of such a statement.

(4) The statement referred to in subsection (3) shall include, where possible, the trade names, chemical names and Chemical Abstract Service Registry (CAS) numbers of the major components of the chemicals.

(5) Each direct discharger shall ensure that the plans submitted under paragraph 1 of subsection 7(1) of the General Effluent Monitoring Regulation identify by type each effluent stream on which the discharger establishes a sampling point under section 6.

(6) For the purpose of subsection (5), effluent stream types are the types mentioned in subsection 6(1).

(7) Each direct discharger shall notify the Director in writing of any change in respect of the information submitted under subsections (1) to (5), within thirty days after the change occurs.

(8) Each direct discharger shall notify the Director in writing of any change of name or ownership of its plant occurring after the 15th day of June, 1989, within thirty days after this Regulation comes into force or within thirty days after any such change.

(9) Each direct discharger shall, no later than thirty days after the event, notify the Director in writing of any process change that occurs after the day this Regulation comes into force, if the change significantly affects the quality of effluent in any effluent stream in that discharger's plant or results in the creation of a new effluent stream in the plant.

(10) Each direct discharger shall report to the Director, on a floppy diskette in a format acceptable to the Director and by hard copy generated from that diskette and signed by the discharger, the results of all analyses performed under sections 7 to 22 and 24 to 26 of this Regulation, including all positive numerical values at or above the analytical method detection limits calculated by the laboratory performing the analysis, together with the date on which each sample was collected and the method used to collect each sample.

(11) For the purposes of subsection (10), each direct discharger shall report the results of analyses of samples collected for analysis for parameters in analytical test groups 1, 3, 4a, 4b, 5a, 6, 7, 8, 9, 12, 15, 16, 17, 19, 20, 23, 26, 27, PP1, PP2 or PP3 within sixty days after the day on which the sample was collected, and shall report the results of analyses of samples collected for analysis for parameters in analytical test groups 24, 28a or 28b within ninety days after the day on which the sample was collected.

(12) Each direct discharger shall, in accordance with subsection 7(6) of the General Effluent Monitoring Regulation, report to the Director the toxicity test information obtained under section 27, together with the date on which each sample was collected under section 27.

(13) For the purposes of subsection (12), each direct discharger shall report the toxicity test information obtained in respect of each sample collected under section 27 within sixty days after the day on which the sample was collected, on a floppy diskette in a format acceptable to the Director and by hard copy generated from that diskette and signed by the discharger.

(14) Each direct discharger shall submit to the Director documentation of any calibration or certification of accuracy required by subsections 28(2) and (3) of this Regulation and subsection 6(2) of the General Effluent Monitoring Regulation, no later than thirty days before the first use of the device for the purposes of this Regulation.

(15) Each direct discharger shall, with respect to each secondary flow measuring device to be used in meeting the requirements of subsection 28(1), submit to the Director, no later than thirty days before the first use of the device for the purposes of this Regulation, documentation sufficient to satisfy the Director that the device complies with the accuracy requirements of subsection 6(1) of the General Effluent Monitoring Regulation.

(16) Each direct discharger shall submit to the Director documentation of each calibration performed under subsection 6(7) of the General Effluent Monitoring Regulation together with the initial report or, if the calibration is performed on or after November 1st, 1989, within thirty days after the calibration was performed.

(17) Each direct discharger shall, within sixty days after making each estimate under subsection 28(4), submit to the Director a description of any methods, devices or calculations used in making the estimate, an assessment of the accuracy of those methods, devices and calculations, and the date of the malfunction in connection with which the estimate was made.

(18) Each direct discharger shall report to the Director the flow measurement information required to be recorded under subsections 28(1) and (4) for each operating day.

(19) Each direct discharger shall, with respect to each method, device and calculation to be used to measure or estimate the flow of a cooling water effluent stream under subsection 28(5), submit to the Director, no later than thirty days before the first use of the method, device or calculation for the purposes of this Regulation, documentation sufficient to satisfy the Director that the method, device or calculation complies with the accuracy requirements of subsection 28(6) of this Regulation.

(20) Each direct discharger shall submit to the Director a description of any methods, devices or calculations to be used in making a measurement or estimate under subsection 28(5) with respect to waste disposal site effluent streams, or in making a measurement or estimate under subsections 28(7) and (8), together with an assessment of the accuracy of the methods, devices and calculations, no later than thirty days before the first use of the method, device or calculation for the purposes of this Regulation.

(21) Each direct discharger shall report to the Director the measured or estimated flow information required to be recorded under subsection 28(5) for each operating day.

(22) Each direct discharger shall report to the Director the information required to be recorded under subsections 28(7) and (8), together with the date of each discharge or overflow measured or estimated under those subsections.

(23) Within thirty days after the end of each quarter that begins on or after the 1st day of January, 1990, each direct discharger shall submit to the Director a statement of the types and quantities of chemicals added to each cooling water effluent stream of that discharger during that quarter, including the dates on which the chemicals were added and, where possible, specifying the trade names, chemical names and Chemical Abstract Service Registry (CAS) numbers of the major components of the chemicals.

(24) Each direct discharger shall record the results of all maintenance and calibration performed on sampling equipment used in meeting the requirements of this Regulation.

(25) Each direct discharger shall keep records of all sampling required by this Regulation, including, for each sample, the date and time of collection, the sampling procedures used, and the amount of sample dilution by preservative if dilution exceeds one per cent.

(26) Each direct discharger shall submit a written report to the Director detailing the date, duration and cause of each sampling, toxicity testing, analytical and flow measurement malfunction or other problem that interferes with fulfilling the requirements of this Regulation, together with a description of any remedial action taken, within sixty days after the day on which the malfunction or problem occurs.

(27) Each direct discharger shall keep records of all analytical methods used in meeting the requirements of this Regulation.

(28) Each direct discharger shall keep all records and reports required by this Regulation to be kept or made for a period of two years following the date of the last report submitted to the Director under this section.

Commencement

30.-(1) This Regulation, except sections 7 to 27 and subsections 28(1) and (4) to (11), comes into force on the day on which it is filed.

(2) Sections 7 to 27 and subsections 28(1) and (4) to (11) come into force on the 1st day of January, 1990.

Revocation

31-.(1) Sections 7 to 28 are revoked on the 1st day of January, 1991.

(2) Subsections 29(7) to (9) and (23) are revoked on the 1st day of February, 1991.

(3) Subsection 29(26) is revoked on the 1st day of March, 1991.

LEGEND FOR SCHEDULES A - L

ATG - Analytical test group

SCHEDULE A - PROCESS EFFLUENT - ALL CATEGORIES

DAILY	THRICE WEEKLY	WEEKLY	MONTHLY	SEMI-ANNUAL
- The parameter in ATG 1 or ATG 5a. - The parameter in ATG 3. - The parameter in ATG 7. - The parameter TSS in ATG 8.	- The parameter in ATG PP1.	- The parameters aluminum and zinc in ATG 9.	- The parameters in ATG 4a. - The parameter in ATG 4b. - The parameter in ATG 6. - The parameters in ATG 9. - The parameter in ATG 12. - The parameters in ATG 16. - The parameters in ATG 17. - The parameters in ATG 19. - The parameters in ATG 20. - The parameters in ATG 23. - The parameters in ATG 26.	PART A - The parameters in ATG 27. PART B - The parameters in ATG 28a. - The parameters in ATG 28b. PART C - The parameters in ATG 24.

SCHEDULE B - PROCESS EFFLUENT - SULPHATE (KRAFT) CATEGORY

	THRICE WEEKLY		MONTHLY	
	- The parameter dehydroabietic acid in ATG 26. - The parameter in ATG PP2. - The parameter in ATG PP3.		**PART A** - The parameter in ATG 15. **PART B** - The parameters in ATG 24.	

SCHEDULE C - PROCESS EFFLUENT - SULPHITE-MECHANICAL & CORRUGATING CATEGORIES

	THRICE WEEKLY			
	- The parameter dehydroabietic acid in ATG 26.			

SCHEDULE D - PROCESS EFFLUENT - DEINKING-BOARD-FINE PAPERS-TISSUE CATEGORY

			MONTHLY	
			PART A - The parameter in ATG PP2. **PART B** - The parameters in ATG 24.	

SCHEDULE E - PROCESS EFFLUENT - MILLS OPERATING BIOLOGICAL TREATMENT PROCESSES

		WEEKLY		
		- The parameters in ATG 4a (but see subsection 16(2)). - The parameter in ATG 4b (but see subsection 16(2)). - The parameter in ATG 6 (but see subsection 16(3)). - The parameter VSS in ATG 8.		

SCHEDULE F - PROCESS EFFLUENT - MILLS USING BLEACHED PULP

			BI-MONTHLY	
			- The parameters in ATG 24.	

SCHEDULE G - COOLING WATER MONITORING - ALL CATEGORIES

			MONTHLY	
			- The parameter in ATG 1 or ATG 5a. - The parameter in ATG 3. - The parameter in ATG 7. - The parameter TSS in ATG 8. - The parameter chromium in ATG 9 (but see subsection 18(2)). - The parameter zinc in ATG 9 (but see subsection 18(3)).	

SCHEDULE H - WASTE DISPOSAL SITE EFFLUENT MONITORING - ALL CATEGORIES

			MONTHLY	
			- The parameter in ATG 3. - The parameters in ATG 4a. - The parameter in ATG 6. - The parameter TSS in ATG 8. - The parameters in ATG 9 (but see subsection 19(2)). - The parameter in ATG 12 (but see subsection 19(2)). - The parameters in ATG 20. - The parameters in ATG 26. - The parameter in ATG PP1.	

SCHEDULE I - BACKWASH EFFLUENT MONITORING - ALL CATEGORIES

			MONTHLY	
			- The parameter in ATG 1 or ATG 5a. - The parameter in ATG 3. - The parameter TSS in ATG 8. - The parameter aluminum in ATG 9 (but see subsection 20(2)).	

SCHEDULE J - EMERGENCY OVERFLOW EFFLUENT MONITORING - ALL CATEGORIES

		PER EMERGENCY OVERFLOW		
		- The parameter in ATG 1 or ATG 5a. - The parameter in ATG 3. - The parameter in ATG 7. - The parameter TSS in ATG 8.		

SCHEDULE K - STORM WATER MONITORING - ALL CATEGORIES

LAND USE OF BARK STORAGE	LAND USE OF BULK STORAGE AND UNLOADING	LAND USE OF CHIP STORAGE	LAND USE OF COAL STORAGE	
- The parameter in ATG 3. - The parameter TSS in ATG 8. - The parameters in ATG 20. - The parameters in ATG 26. - The parameter in ATG PP1.	- The parameter in ATG 1 or ATG 5a. - The parameter in ATG 3. - The parameter in ATG 7. - The parameter TSS in ATG 8.	- The parameter in ATG 3. - The parameter TSS in ATG 8. - The parameters in ATG 20. - The parameters in ATG 26. - The parameter in ATG PP1.	- The parameter in ATG 1 or ATG 5a. - The parameter in ATG 3. - The parameters in ATG 4a. - The parameter in ATG 7. - The parameter TSS in ATG 8. - The parameters in ATG 9. - The parameter in ATG 12. - The parameters in ATG 19.	

LAND USE OF WASTE DISPOSAL SITE	LAND USE OF WASTE PAPER STORAGE	LAND USE OF WOOD STORAGE		
- The parameter in ATG 1 or ATG 5a. - The parameter in ATG 3. - The parameter in ATG 7. - The parameter TSS in ATG 8. - The parameters in ATG 9 (but see subsection 22(3)). - The parameter in ATG 12. (but see subsection 22(3)). - The parameters in ATG 20. - The parameters in ATG 26.	- The parameter in ATG 3. - The parameter TSS in ATG 8. - The parameters in ATG 20. - The parameter in ATG PP1.	- The parameter in ATG 3. - The parameter TSS in ATG 8. - The parameters in ATG 20. - The parameters in ATG 26. - The parameter in ATG PP1.		

SCHEDULE L - ANALYTICAL LIST

COLUMN 1	COLUMN 2	COLUMN 3
ATG #	ANALYTICAL TEST GROUP (ATG)	PARAMETERS TO BE ANALYZED
1	Chemical Oxygen Demand	Chemical oxygen demand (COD)
3	Hydrogen ion (pH)	Hydrogen ion (pH)
4	Nitrogen	
a	Ammonia plus Ammonium Total Kjeldahl nitrogen	Ammonia plus Ammonium Total Kjeldahl nitrogen
b	Nitrate + Nitrite	Nitrate + Nitrite
5a.	Organic carbon (DOC)	Dissolved Organic Carbon (DOC)
6	Total phosphorus	Total phosphorus
7	Specific conductance	Specific conductance
8	Suspended solids	Total suspended solids (TSS) Volatile suspended solids (VSS)
9	Total metals	Aluminum Beryllium Cadmium Chromium Cobalt Copper Lead Molybdenum Nickel Silver Thallium Vanadium Zinc
12	Mercury	Mercury
15	Sulphide	Sulphide

SCHEDULE L - ANALYTICAL LIST

COLUMN 1 ATG #	COLUMN 2 ANALYTICAL TEST GROUP (ATG)	COLUMN 3 PARAMETERS TO BE ANALYZED
16	Volatiles, Halogenated	1,1,2,2-Tetrachloroethane 1,1,2-Trichloroethane 1,1-Dichloroethane 1,1-Dichloroethylene 1,2-Dichlorobenzene 1,2-Dichloroethane (Ethylene dichloride) 1,2-Dichloropropane 1,3-Dichlorobenzene 1,4-Dichlorobenzene Bromoform Bromomethane Carbon tetrachloride Chlorobenzene Chloroform Chloromethane Cis-1,3-Dichloropropylene Dibromochloromethane Dichlorobromomethane Ethylene dibromide Methylene chloride Tetrachloroethylene (Perchloroethylene) Trans-1,2-Dichloroethylene Trans-1,3-Dichloropropylene Trichloroethylene Trichlorofluoromethane Vinyl chloride (Chloroethylene)
17	Volatiles, Non-Halogenated	Benzene Styrene Toluene o-Xylene m-Xylene and p-Xylene

SCHEDULE L - ANALYTICAL LIST

COLUMN 1	COLUMN 2	COLUMN 3
ATG #	ANALYTICAL TEST GROUP (ATG)	PARAMETERS TO BE ANALYZED
19	Extractables, Base Neutral	Acenaphthene 5-nitro Acenaphthene Acenaphthylene Anthracene Benz(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Benzo(ghi)perylene Benzo(k)fluoranthene Camphene 1-Chloronaphthalene 2-Chloronaphthalene Chrysene Dibenz(a,h)anthracene Fluoranthene Fluorene Indeno(1,2,3-cd)pyrene Indole 1-Methylnaphthalene 2-Methylnaphthalene Naphthalene Perylene Phenanthrene Pyrene
20	Extractables, Acid (Phenolics)	2,3,4,5-Tetrachlorophenol 2,3,4,6-Tetrachlorophenol 2,3,5,6-Tetrachlorophenol 2,3,4-Trichlorophenol 2,3,5-Trichlorophenol 2,4,5-Trichlorophenol 2,4,6-Trichlorophenol 2,4-Dimethyl phenol 2,4-Dinitrophenol 2,4-Dichlorophenol 2,6-Dichlorophenol 4,6-Dinitro-o-cresol 2-Chlorophenol 4-Chloro-3-methylphenol 4-Nitrophenol m-Cresol o-Cresol p-Cresol Pentachlorophenol Phenol

SCHEDULE L - ANALYTICAL LIST

COLUMN 1 ATG #	COLUMN 2 ANALYTICAL TEST GROUP (ATG)	COLUMN 3 PARAMETERS TO BE ANALYZED
23	Extractables, Neutral -Chlorinated	1,2,3,4-Tetrachlorobenzene 1,2,3,5-Tetrachlorobenzene 1,2,4,5-Tetrachlorobenzene 1,2,3-Trichlorobenzene 1,2,4-Trichlorobenzene 2,4,5-Trichlorotoluene Hexachlorobenzene Hexachlorobutadiene Hexachlorocyclopentadiene Hexachloroethane Octachlorostyrene Pentachlorobenzene
24	Chlorinated Dibenzo-p-dioxins and Chlorinated Dibenzofurans	2,3,7,8-Tetrachlorodibenzo-p-dioxin Octachlorodibenzo-p-dioxin Octachlorodibenzofuran Total heptachlorinated dibenzo-p-dioxins Total heptachlorinated dibenzofurans Total hexachlorinated dibenzo-p-dioxins Total hexachlorinated dibenzofurans Total pentachlorinated dibenzo-p-dioxins Total pentachlorinated dibenzofurans Total tetrachlorinated dibenzo-p-dioxins Total tetrachlorinated dibenzofurans
26	Fatty and Resin Acids	Abietic Acid Chlorodehydroabietic Acid Dehydroabietic Acid Isopimaric Acid Levopimaric Acid Neoabietic Acid Oleic Acid Pimaric Acid
27	Polychlorinated Biphenyls (PCBs) (Total)	PCBs (Total)
28a	Open Characterization	Volatile Organic Compounds
28b	Open Characterization	Extractable Organic Compounds
PP1	Biochemical Oxygen Demand (5 Day)	Biochemical Oxygen Demand (BOD5)
PP2	Adsorbable Organic Halide	Adsorbable Organic Halide (AOX)
PP3	Dichlorodehydroabietic Acid	Dichlorodehydroabietic Acid

SCHEDULE 1 - SAMPLING PRINCIPLES

Column 1 ANALYTICAL TEST GROUP #	Column 2 LABORATORY SAMPLE CONTAINER	Column 3 LABORATORY CONTAINER PRE-TREATMENT	Column 4 TEST SPECIFIC SAMPLING PRECAUTIONS	Col. 5 MIN. SAM. VOL.	Column 6 PRESERVATION METHOD	Column 7 STORAGE TIME (DAYS)
FATTY AND RESIN ACIDS						
26	Amber glass or fluorocarbon resin with fluorocarbon resin lined cap.	If pre-treatment necessary: Bottle: Sequence of extensive washing/hot water, detergent, water,distilled water. Bake at 300 C for 8 hr minimum or rinse 3 times with pesticide grade or distilled in glass hexane and dichloromethane. Cap: No pre-treatment.	Contact surfaces must be glass, flurocarbon resin or stainless steel.	800 ml	None	7
BIOCHEMICAL OXYGEN DEMAND (BOD5)						
PP1	Sample containers and caps/ liners must be composed only of one or more of the following materials: fluorocarbon resin, polyethylene terephthalate, glass, polystyrene, polypropylene, high or low density polyethylene.	Generally no pre-treatment required for new containers.	If sample is high (>5%) in hydrocarbons or organic solvents, use glass or fluorocarbon resin sample container only.	500 ml	None	4

SCHEDULE 1 - SAMPLING PRINCIPLES

Column 1	Column 2	Column 3	Column 4	Col. 5	Column 6	Column 7
ANALYTICAL TEST GROUP #	LABORATORY SAMPLE CONTAINER	LABORATORY CONTAINER PRE-TREATMENT	TEST SPECIFIC SAMPLING PRECAUTIONS	MIN. SAM. VOL.	PRESERVATION METHOD	STORAGE TIME (DAYS)
ADSORBABLE ORGANIC HALIDE (AOX)						
PP2	Amber glass or fluorocarbon resin with fluorocarbon resin lined cap.	Generally no pre-treatment required for new containers.	Fill sample container to the top leaving no air space.	1 L	None	14
DICHLORODEHYDROABIETIC ACID						
PP3	See Analytical Test Group 26	See Analytical Test Group 26	See Analytical Test Group 26	See Analytical Test Group 26	See Analytical Test Group 26	See Analytical Test Group 26

SCHEDULE 2 - ANALYTICAL PRINCIPLES & ANALYTICAL METHOD DETECTION LIMITS

Column 1 ANALYTICAL TEST GROUP #	Column 2 PARAMETERS	Column 3 SAMPLE PREPARATION METHOD PRINCIPLES	Column 4 INSTRUMENTAL MEASUREMENT METHOD PRINCIPLES	Column 5 ALTERNATE INSTRUMENTAL MEASUREMENT METHOD PRINCIPLES	Column 6 ANALYTICAL METHOD DETECTION LIMITS mg/l
FATTY AND RESIN ACIDS					
26	Abietic Acid Chlorodehydroabietic Acid Dehydroabietic Acid Isopimaric Acid Levopimaric Neoabietic Acid Oleic Acid Pimaric Acid	pH adjusted to 9, Liquid/Liquid extraction with methyl t-butyl ether. Methylation with diazomethane.	Gas Chromatography/ Flame Ionization Detection Capillary Column.	N/A	0.005
BIOCHEMICAL OXYGEN DEMAND (BOD5)					
PP1 See Note 1	5-Day Biochemical Oxygen Demand (BOD5)	Preparation for measurement system as appropiate; e.g. destruction of chlorine, neutralization of pH, and stabilization of sample to 20 C. Preparation of seed and dilution water as appropiate. Dilution of sample to provide adequate oxygen depletion over five day period.	Dissolved oxygen determination by Winkler Method or by oxygen electrode verified by Winkler Method for one sample per analytical run on days of analysis.	None	5

Note 1 - For each analytical run perform a BOD5 test on seeded dilution water, and the BOD5 of the seeded dilution water spiked with one or more organic compounds; e.g. glucose and glutamic acid.

SCHEDULE 2 - ANALYTICAL PRINCIPLES & ANALYTICAL METHOD DETECTION LIMITS

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
ANALYTICAL TEST GROUP #	PARAMETERS	SAMPLE PREPARATION METHOD PRINCIPLES	INSTRUMENTAL MEASUREMENT METHOD PRINCIPLES	ALTERNATE INSTRUMENTAL MEASUREMENT METHOD PRINCIPLES	ANALYTICAL METHOD DETECTION LIMITS mg/l
ADSORBABLE ORGANIC HALIDE (AOX)					
PP2	Total Adsorbable Organic Halide	Carbon adsorption (column or shaker) at pH 2 followed by nitrate wash, Dohrmann charcoal 100-200 mesh granular activated carbon or equivalent.	Pyrolysis in an oxygen rich atmosphere followed by microcoulometric analysis.	None	0.05 See Note 2
DICHLORODEHYDROABIETIC ACID					
PP3	Dichorodehydroabietic Acid	See Analytical Test Group 26	See Analytical Test Group 26	See Analytical Test Group 26	See Analytical Test Group 26

Note 2 - Based on 2,4,6-Trichlorophenol

PART IV

THE EXPLANATORY NOTES TO THE EFFLUENT MONITORING REGULATION FOR THE PULP AND PAPER SECTOR.

EXPLANATORY NOTES TO THE
EFFLUENT MONITORING REGULATION
FOR THE PULP AND PAPER SECTOR

INTRODUCTION

These explanatory notes are intended to clarify the sections of the Pulp and Paper Sector Effluent Monitoring Regulation.

In conjunction with the protocols and procedures outlined in the General Effluent Monitoring Regulation, this Regulation specifies the monitoring requirements for mills including the requirements for sampling, analysis, flow measurement, toxicity testing and reporting.

SECTION 1: DEFINITIONS

This section of the Regulation provides:-

- clarification of terms used in the Regulation;
- definitions of technical terms used in the Regulation;
- modifications to definitions which appear in the General Effluent Monitoring Regulation for suitable application to the pulp and paper sector.

The definitions in the General Effluent Monitoring Regulation have been applied to the Pulp and Paper Sector Regulation with the following exceptions:-

- "effluent" has been redefined and "effluent stream" has been defined such that only those streams that discharge 'directly' to a surface watercourse will be monitored under this Regulation;
- "emergency overflow" has been redefined to mean a diversion of effluent that bypasses a waste treatment system;
- "grab sample" has been redefined to include the sample containers in column 2 of Schedule 1 of this Regulation and to allow for samples to be transferred in a more practical time frame rather than 'immediately';

- "operating day" has been redefined to allow each mill to specify the time at which its operating day commences. This time must be reported by each mill in its initial report;

- "Plant" has been redefined so that any operations associated with the mill that are not located on the mill site are not included in this Regulation. Specifically, woodlands operations and off-site waste disposal sites are excluded;

- "process effluent sampling point" has been redefined as a location in a process effluent stream. The (a), (b) and (c) qualifying clauses of the definition in the General Effluent Monitoring Regulation were considered to be inappropriate for this sector.

- "sample" has been redefined to include combined sample;

- "travelling blank sample" and "travelling spiked blank sample" have been redefined to allow the introduction of Section 23 which details the requirements associated with these types of sample;

- "waste disposal site effluent" has been redefined to exclude from the definition the liquid that percolates through a waste disposal site and also to exclude effluents from waste disposal sites used for the temporary storage of bark or wood wastes that are to be used as fuel.

The other definitions in this Regulation were necessary to the structure of the Sector Regulation. The following definitions should be noted:-

- "Backwash effluent" is included because some mills operate water treatment systems for process water. Backwash is intended to cover any filter residues or clarifier sludges that are discharged from the water treatment operations directly into the receiving watercourse. Backwashes that are discharged into process sewers and are monitored as part of the process effluent, are not required to be separately monitored.

- "Bleached pulp" has been defined to accommodate the monitoring requirements for chlorinated dioxins and dibenzofurans at mills which use bleached pulp.

- "Catchment area" has been defined in relation to the "BEAK" report, "A Survey Of Stormwater Runoff at Ontario Pulp and Paper Mills", dated 1988.

- "Process change" has been defined to clarify the types of change that must be reported under subsection 29 (8).

Subsection 1 (2) states that the definitions in the General Effluent Monitoring Regulation apply to this Regulation unless redefined in this Regulation.

Subsection 1 (3) gives priority to definitions in this Regulation over definitions in the General Effluent Monitoring Regulation.

Subsection 1 (4) clarifies that wherever reference is made to "parameters in an analytical test group" in this Regulation it means all of the parameters that are listed in Schedule L under that analytical test group (ATG).

SECTION 2: PURPOSE

This section simply states the purpose of this Regulation.

SECTION 3: APPLICATION

Subsection 3 (1) stipulates that only the 27 mills listed under subsection 3 (2) are subject to the requirements of this Regulation.

Subsection 3 (2) lists the 27 mills covered under this Regulation and divides them into categories.

Subsection 3 (3) establishes this Regulation as a "Sectoral Regulation" under the General Effluent Monitoring Regulation so that the provisions of the General Effluent Monitoring Regulation will apply.

> **It is important that this Regulation be read in conjunction with the General Effluent Monitoring Regulation. Many of the requirements for sampling, analysis, flow measurement and reporting are contained in the General Effluent Monitoring Regulation and will apply to all mills.**

SECTION 4: COMBINED SAMPLING

Subsection 4 (1) allows a mill to use combined samples for the purpose of monitoring process effluent streams under this Regulation where the mill satisfies the Ministry's Regional Director of the need to use a combined sample in place of individual process effluent stream samples.

> **Combined samples will only be allowed where it is demonstrated that it is physically difficult or excessively costly to collect a true single effluent sample, and where it can be demonstrated that analyses of the samples of contributory streams that are collected in place of a single sample, would not yield representative results.**

Subsection 4 (2) requires that combined samples shall be analyzed as if they were process effluent samples.

Subsection 4 (3) means that all provisions in the General Effluent Monitoring Regulation that apply to the sampling and analysis of process effluents will apply also to combined samples.

SECTION 5: MONITORING PRINCIPLES

Subsection 5 (1) requires that the monitoring obligations of this Regulation shall be carried out in accordance with the requirements of the General Effluent Monitoring Regulation.
(See note under (3) above)

Subsection 5 (2) covers sampling and analytical obligations for parameters that are not covered by the General Effluent Monitoring Regulation and requires that these obligations are to be carried out in accordance with Schedules 1 and 2 of this Regulation.

Subsection 5 (3) exempts mills from the minimum sample size requirements set out in subsection 3 (23) of the General Effluent Monitoring Regulation and allows mills to collect samples in accordance with the sample size requirements of the laboratory which is analyzing the samples, providing the laboratory analyses meet the method detection limits specified in the General Effluent Monitoring Regulation or Schedules 2 of this Regulation.

Subsection 5 (4) in effect defines a "set of samples" as being the number of individual samples that are required by a laboratory in order to carry out all of the analyses required for a set of samples under this Regulation.

SECTION 6: SAMPLING POINTS

Subsection 6 (1) requires mills to establish sampling points on each of the types of effluent stream listed.

> **(Note: It goes without saying where a mill does not have an effluent stream listed under subsection 6 (1), it will**

not be required to a establish sampling points on the non-existent stream.)

A waste disposal site effluent stream as referenced under this subsection, para 5, means an effluent stream which flows regularly or continuously as opposed to an effluent stream which only flows intermittently as the result of rainfall.

Subsection 6 (2) requires any mill that is going to collect combined samples to establish sampling points on each of the contributory streams which are to be sampled to make up the combined sample, by November 1, 1989. The subsection also exempts the mill from establishing a sampling point on the actual process effluent stream which would normally have been sampled if combined samples were not going to be not going to be collected.

Subsection 6 (3) requires that a mill need only establish a sampling point on the storm water effluent stream from the largest catchment area in the event that the mill has more than one catchment area on which a bark pile is located.

Subsection 6 (4) allows the same provision as subsection 6 (3) for mills having more than one catchment area on which the land use is for chip storage, waste paper storage or wood storage.

The intent of the Regulation with respect to sampling for storm water is that only the storm water from the largest catchment area need be sampled in the event that a mill has more than one catchment area used for the storage of bark, chip, wood and waste paper.

Also, where a given catchment area has more than one land use, the analytical requirements for the respective land uses as set out in Schedule K, need not be duplicated where the same analytical parameters are required.

Subsection 6 (5) means that a waste disposal site that only discharges effluent as the direct result of precipitation is not considered to be a waste disposal site that "regularly " discharges effluent and, therefore, it is not necessary to establish a sampling point for that waste disposal site. (ie. an exemption from establishing a sampling point under Subsection 6 (1), paragraph 5.

Subsection 6 (6) allows a mill to use alternate sampling points to those established under subsections 6 (1), (2), (3), and (4) with approval of the Ministry's Regional Director.

Subsection 6 (7) requires that all samples of **process effluents** (including combined samples) **must be collected as composite samples.**

Subsection 6 (8) requires that samples of **cooling water** shall be collected using an autosampler or by collecting at least eight grab samples during the 24-hour operating day period and compositing the grabs.

Subsection 6 (9) allow samples of backwash effluent, storm water effluent, emergency overflow and waste disposal site effluent to be collected using an autosampler **or by collecting one grab sample.**

Subsection 6 (10) stipulates that not all samples required to be collected have to be collected on the same day, unless otherwise stipulated.

PROCESS EFFLUENTS - ALL CATEGORIES

The requirements of Sections 7, 8, 9, 10 and 11 are basic monitoring requirements that apply to all mills.

SECTION 7: DAILY MONITORING

This section requires that mills must collect samples of process effluents on a daily basis and analyze these samples for:-

COD/DOC
pH
Total suspended solids
Specific conductance

The intent of this section is to provide mills with an option of initially selecting either COD or DOC. Mills are not required to perform both but having once selected either COD or DOC for a particular effluent stream, the mill should not change the parameter during the course of the regulation.

SECTION 8: THRICE WEEKLY MONITORING

This section requires that all mills must collect composite samples of process effluents three times per week and analyze these samples for:-

BOD5

SECTION 9: WEEKLY MONITORING

Subsection (1) requires that all mills must collect samples of process effluents once per week and analyze those samples in accordance with the principles of ATG 9, for:-

Aluminum
Zinc

Subsection (2) requires that there should be at least two days between successive samplings.

This is intended to avoid the possibility of collecting samples on two successive days, such as Saturday and Sunday.

SECTION 10: MONTHLY MONITORING

Subsection (1) requires that a set of samples must be collected once per month from each process effluent stream and analyzed for:-

Nitrogen (ammonia, Kjeldahl, nitrite/nitrate)
Phosphorus
ATG's 9, 12, 16, 17,19, 20, 23 and 26
(sector characterization)

Subsection (2) requires that for monthly monitoring, there should be a period of at least two weeks between successive samplings of any process effluent stream.

Where a mill has performed analyses for nitrogen and phosphorus on a weekly basis under Section 16, that mill does not have to perform additional sample collection and analysis under this Section.

SECTION 11: SEMI- ANNUAL MONITORING

This section is split into three requirements that deal individually with :-

Polychlorinated Biphenyls (PCB's);
Organic open scans; and
Chlorinated dioxins and dibenzofurans.

Subsection (1) requires that mills must collect samples of process effluents twice per year and analyze those samples for PCB's according to the principles of ATG 27.

Subsection (2) requires that mills must collect samples of process effluents twice per year and perform an organic open characterization (open scan) on those samples according to the principles of ATG 28a and 28b.

Subsection (3) requires that the samples collected under subsections (1) and (2) above shall be collected on the same day as samples are collected under the monthly monitoring requirements of subsection 10 (1).

> Collecting all these samples on the same day will correlate the sector characterization with the open characterization.

Subsections (4) and (5) require that samples collected under subsections (1) and (2) shall be collected with a time interval of at least 180 days between samplings.

Subsection (6) requires that mills must collect samples of process effluents twice per year and analyze those samples for chlorinated dioxins and dibenzofurans according to the principles of ATG 24.

Subsections (7) requires that the samples of process effluents collected under subsection (6) shall be collected with a time interval of at least 180 days between successive samplings.

PROCESS EFFLUENTS - SPECIFIC ADDITIONAL REQUIREMENTS

FOR KRAFT MILLS

Kraft mills are being required to monitor their process effluents for other parameters in addition to the basic requirements of sections 7 through 11.

Subsection 12 (1) requires that kraft mills shall collect samples of process effluents **three times per week** and analyze those samples for:-

Dehydroabietic acid;
Adsorbable organic halide (AOX); and
Dichlorodehydroabietic acid.

Subsection 12 (2) requires that at least one of the sets of samples collected under subsection 12(1) shall be collected on the same day on which a sample is collected under subsection 10 (1).

> This requirement allows the samples to be correlated with the sector characterization and the toxicity tests - ref. subsection 27 (1).

Subsection 13 (1) requires all kraft mills to collect samples of process effluent **once per month** and analyze those samples for **sulphide** in accordance with the principles for ATG 15.

Again, the samples collected under subsection 13 (1) must be collected on the same day as samples are collected under subsection 10 (1).

Subsection 13 (3) requires that all kraft mills shall, **once per month,** collect samples of process effluents and analyze those samples for **chlorinated dioxins and dibenzofurans** in accordance with the principles of ATG 24.

> (Note: this requirement is not in addition to the requirements under Subsection 11 (6). The two samples collected under 11 (6) will qualify as two of the twelve samples required under this subsection.)

Subsection 13 (4) requires that samples collected under subsection 13 (3) shall be collected with at least two weeks between successive samplings

PROCESS EFFLUENTS - SPECIFIC ADDITIONAL REQUIREMENTS FOR SULPHITE-MECHANICAL AND CORRUGATING MILLS

Sulphite-mechanical and corrugating mills are being required to monitor their process effluents for one other parameter in addition to the basic requirements of sections 7 through 11.

Section 14 requires that each mill in the Sulphite-Mechanical & Corrugating Category must collect composite samples of process effluent **three times per week** and analyze those samples for **dehydroabietic acid** in accordance with the principles of ATG 26.

PROCESS EFFLUENTS - SPECIFIC ADDITIONAL REQUIREMENTS FOR DEINKING-BOARD-FINE PAPERS-TISSUE MILLS

Deinking-Board-Fine Papers and Tissue mills are being required to monitor their process effluents for other parameters **in addition to** the basic requirements of sections 7 through 11.

> **These additional requirements apply only to mills that use chlorine or chlorine derivatives for bleaching or brightening fibre, and probably at this time, only apply to the "Fraser" mill in Thorold.**

Any mill in this category that uses chlorine or chlorine derivatives to bleach fibre is require to collect samples from its process effluents **once in each month** and analyze those samples for:-

> **Adsorbable organic halide (AOX)** in accordance with the principles of ATG PP2. (subsection 15 (1))
>
> **Chlorinated dioxins and dibenzofurans** in accordance with the principles of ATG 24. (subsection 15 (3))

Subsection 15 (2) requires that any samples collected under subsection 15 (1) shall be collected on the same day as samples are collected under subsection 10 (1)

Subsection 15 (4) requires that there should be at least two weeks between successive samplings for samples collected under subsection 15 (3).

Subsection 15 (5) exempts any mill in this category that does not use chlorine or chlorine derivatives for bleaching fibre from the requirements of subsections 15 (1) and (3).

PROCESS EFFLUENTS - SPECIFIC ADDITIONAL REQUIREMENTS FOR MILLS OPERATING BIOLOGICAL TREATMENT PROCESSES

Section 16 requires mills that operate biological treatment plants to collect samples of the **process effluents containing treated effluent once per week** and analyze the samples for:-

Nitrogen (ammonia, Kjeldahl, nitrate/nitrite)
Total Phosphorus
Volatile suspended solids.

Subsections 16 (2) and (3) exempt a mill from the requirements to analyze for nitrogen and phosphorus if the mill does not add either nitrogen compounds or phosphorus compounds to the biological treatment plant. (Note: ref. section 10)

Subsection 16 (4) requires that there should be at least two weeks between successive samplings for samples collected under subsection 16 (1).

PROCESS EFFLUENTS - SPECIFIC ADDITIONAL REQUIREMENTS FOR MILLS USING BLEACHED PULP

All mills which use bleached pulp in their manufacturing operations but do not manufacture bleached pulp are being required under subsection 17 (1) to analyze their **process effluents every second month for chlorinated dioxins and dibenzofurans** in accordance with the principles of ATG 24.

This requirement does not apply to kraft mills which are already analysing for these parameters monthly, under the requirements of subsection 13 (3).

Subsection 17 (2) requires that there should be at least six weeks between successive samplings for samples collected under subsection 17 (1).

Subsections 17 (3), (4) and (5) deal with mills which do not normally or constantly use bleached pulp in their manufacturing operations. These mills would only use bleached pulp as a substitute for other pulps that are normally used in manufacturing or intermittently to make grades of product which require bleached pulp.

The requirements under these subsections are for such mills to collect samples of their **process effluents once during each month that bleached pulp is being used, up to a maximum of six samples over the course of the Regulation**, and to analyze those samples for chlorinated dioxins and dibenzofurans in accordance with the principles of ATG 24.

COOLING WATER - ALL CATEGORIES

The requirements for monitoring cooling water are different than those for process effluents.

Subsection 18 (1) requires mills to collect composite samples of cooling water effluent **once per month** and analyze those samples for:-

COD or DOC
pH
Specific conductance
Total suspended solids
Total chromium
Zinc.

Subsections 18 (2) and (3) exempt mills from the requirement to analyze for total chromium or zinc, respectively, if the mills do not add chromium or zinc salts to their cooling waters.

Subsection 18 (4) requires that there should be at least two weeks between successive samplings for samples collected under subsection 18 (1).

WASTE DISPOSAL SITE EFFLUENT - ALL CATEGORIES

Mills which operate waste disposal sites (as defined under the Ontario Environmental Protection Act) that are "on-site", are being required to sample and analyze effluents from such waste disposal sites in cases where there is a "regular" discharge of effluent.

> **In this context, the use of the word "regularly" in subsection 6 (1), paragraph 5, covers those sites which produce a more or less continuous flow of effluent or those sites which collect and store leachate and discharge that leachate as an effluent at periodic intervals.**

> **The intent is to differentiate these sites from waste disposal sites which only discharge effluent during or immediately following a precipitation event, and which do not normally have a continuous flow of effluent. Any waste disposal site which receives wastes containing a high percentage of water, (eg. hydraulically sluiced bark) will likely produce a more or less continuous effluent and would be subject to the requirements of subsection 19 (1).**
>
> **Waste disposal sites which only have effluents following precipitation are regulated under Section 22 - Storm water Monitoring.**

Subsection 19 (1) requires any mill with a waste disposal site to collect a sample of waste disposal site effluent **once per month,** and to analyze the sample for:

BOD5
pH
Kjeldahl nitrogen and ammonia
Total phosphorus
Total suspended solids
Acid extractables (ATG 20)
Resin and fatty acids. (ATG 26)
Mercury
Total metals (ATG 9).

Subsection 19 (2) exempts a mill from analyzing the effluent for total metals and mercury if the mill does not dispose of chemical sludges at the waste disposal site.

Subsection 19 (3) requires that there should be at least two weeks between successive samplings for samples collected under subsection 18 (1).

BACKWASH EFFLUENT - ALL CATEGORIES

Many mills which take process water from a river or lake, treat this water prior to use in the mill, usually to remove suspended solids or turbidity. Such operations normally involve filtering or sedimentation which requires periodic backwashing or purging. During backwashing or purging, the solids and other materials which have accumulated on the filter medium or in the sedimentation device are usually flushed out and discharged to a watercourse. This material that is discharged is termed backwash effluent and mills are required to monitored these effluents under the Regulation.

> **Only backwash effluents that discharge directly to a watercourse via a separate sewer are required to be monitored. Those effluents that discharge into other streams that are monitored under sections other than section 20, are exempt from the requirements of section 20.**

Subsection 20 (1) requires a mill to collect samples of backwash effluent **once per month** and analyze the sample for:-

COD or DOC
pH
Total suspended solids.
Aluminum.

Subsection 20 (2) exempts any mill which does not add aluminum compounds to its water treatment operations from the requirement to analyze for aluminum.

Subsection 20 (3) requires that there should be at least two weeks between successive samplings for samples collected under subsection 20 (1).

EMERGENCY OVERFLOWS - ALL CATEGORIES

Under this regulation, mills are being required to **monitor each event** that is classified as an emergency overflow. Under the amended definition, "emergency overflow" is qualified as an overflow that bypasses a sampling point established under Subsection 6 (1) and would therefore, not be monitored before it discharges to the receiver.

> **This requirement assumes that the collection of appropriate samples is physically possible during an event and that the event is of sufficient duration to allow samples to be collected.**

Subsection 21 (1) requires that samples of emergency overflow effluent must be collected **during each emergency overflow event** and analyzed for:-

COD or DOC (one or the other is required)
pH
Specific conductance
Total suspended solids.

Subsection 21 (2) exempts the mill from collecting samples if the collection would result in danger to health and safety.

STORM WATER DISCHARGES - ALL CATEGORIES

Storm water sampling and analysis is being required for storm water effluent discharges originating from catchment areas having specific land uses as defined in the "BEAK" report. The BEAK report identifies a number of land uses which take place on catchment areas of mill sites and the Regulation is requiring monitoring for those land uses which are deemed to be of concern. These are:-

- bark storage
- wood storage
- coal storage
- bulk storage and unloading.
- chip storage
- waste paper storage
- waste disposal site

Subsection 22 (1) requires that samples of storm water must be collected **twice per year** from each storm water effluent sampling point established by individual mills under subsections 6 (1)(4) and subject to subsection 6 (2).

Subsection 22 (2) requires mills to analyze the samples collected under subsection 22 (1) for the parameters listed in the respective columns of Schedule K.

Subsection 22 (3) exempts mills from analyzing waste disposal storm water samples for ATG's 9 and 12 (metals) if the mill does not dispose of chemical sludges at the waste disposal site.

Subsection 22 (4) requires that the samples be collected on a day on which there is a storm event.

(Note: storm event is defined in the General Effluent Monitoring Regulation.)

Subsection 22 (5) requires that there should be at least 90 days between successive samplings for samples collected under subsection 22 (1).

There are a number of mills which do not have catchment areas with any of the land uses listed under subsection 21 (1). Such mills are not required, therefore, to monitor storm waters.

TRAVELLING BLANK AND TRAVELLING SPIKED BLANK SAMPLES

As part of the Quality Assurance and Quality Control program built into the Regulation, mills are required to process travelling blank samples and travelling spiked blank samples during the course of monitoring.

Subsections 23 (1) and (2) stipulate the requirements with respect to processing travelling blank samples when they are required.

Subsections 23 (3) and (4) stipulate the requirements for processing travelling spiked blank samples where they are required.

Of particular note is the requirement under subsection 23 (3)(c) that the travelling spiked blank must be prepared within 24 hours of accompanying the sample containers to the mill. Also, note that under subsection 23 (4), travelling spiked blank samples for fatty and resin acids need only be prepared using a standard solution of dehydroabietic acid.

QUALITY CONTROL MONITORING

Quality control samples are being required to provide assurance on the quality of the data being generated and to provide any indication of field contamination. Quality control samples **are only required for process effluents.**

Quality Control Monitoring Of Daily and Thrice Weekly Sampling

Section 24 stipulates the requirements for quality control monitoring of daily and thrice weekly sampling.

Once per month, and with at least two weeks between successive samplings, **duplicate samples** must be collected for samples collected under the daily and thrice weekly requirements of Sections 7, 8, 12 (1) and 14, and these duplicates must be analyzed for the same parameters as the samples for which they were collected.

Once in each two-month period, (six times per year) **travelling blank samples and travelling spiked blank samples** must be processed in accordance with section 23, for each sample collected under sections 12 (1) and 14 and analyzed for the same parameters as the samples for which they were collected.

Quality Control Monitoring Of Weekly and Monthly Sampling

Section 25 stipulates the requirements for quality control monitoring of **weekly and monthly sampling.**

Once in each quarter and with at least six weeks between successive samplings, duplicate samples must be collected for samples collected under the weekly and monthly requirements of Sections 16 (1), 10 (1), 13 (1), 13 (3), 15 (1) and 15 (3), and these duplicates must be analyzed for the same parameters as the samples for which they were collected.

Semi-annually and in accordance with the requirements of the definition of semi-annually, travelling blank samples and travelling spiked blank samples must be processed in accordance with Section 23 for each sample collected under sections 10 (1), 13 (3) and 15 (3) and analyzed for the parameters set out in subsections 25 (8), (9) and (10).

Quality Control Monitoring of Bimonthly Sampling

Section 26 stipulates the requirements for quality control monitoring of **bi-monthly sampling.**

Semi-annually and in accordance with the requirements of the definition of semi-annually, each direct discharger that uses bleached pulp and collects samples under section 17 (1), must collect a duplicate sample and a travelling blank sample for each sample collected under subsection 17 (1), and analyze the duplicate samples and travelling blank samples for chlorinated dioxins and dibenzofurans in accordance with the principles of ATG 24.

TOXICITY TESTING -ALL CATEGORIES

Toxicity testing, with both rainbow trout and Daphnia magna, is being required **once per month for all process effluent streams and all cooling water effluent streams.**

> **Where the first three months of testing indicate that a process effluent stream or a cooling water effluent stream is non-acutely toxic to rainbow trout, the Regulation allows the frequency of rainbow trout testing to be reduced to quarterly. Testing with Daphnia magna remains at the monthly level.**
>
> **If at any time under the reduced frequency of testing, more than five of the ten fish tested die at any of the**

test dilutions, the Regulation requires that the frequency of testing revert back to the original monthly frequency until such time as three consecutive month's of testing indicate that the effluent is once again non-acutely toxic.

Section 27 details the requirements for rainbow trout toxicity testing and Daphnia magna toxicity testing for process effluents and cooling water effluents.

Note the requirement under subsection 27 (1) that samples of process effluent collected for toxicity testing must be collected on the same day as samples are collected under subsection 10 (1).

FLOW MEASUREMENT - ALL CATEGORIES

The General Effluent Monitoring Regulation prescribes the levels of accuracy required for primary and secondary flow measuring devices to be used in the MISA monitoring programme.

Subsection 6(2) of the General Effluent Monitoring Regulation allows the use of existing primary flow measuring devices where the mill can demonstrate by calibration that the overall accuracy (primary plus secondary) of a existing device is less than ± 15%.

All new flow measuring devices must meet the overall ± 7% accuracy requirement of subsection 6(1) of the General Effluent Monitoring Regulation.

Section 28 of this Regulation sets out additional requirements and options with respect to flow measurement, flow and volume estimation and calibration of primary flow measuring devices.

Subsection (1) requires all mills to continuously measure the flow of each process effluent stream and to record the flow information. The accuracy requirements of the General Effluent Monitoring Regulation will apply for the primary and secondary flow measuring device.

Subsection (2) requires all mills to calibrate their primary flow measuring devices used to measure the flow of process effluent, and to document to the Director that the devices are meeting the ± 5% accuracy required under the General Effluent Monitoring Regulation.

> **Alternatives to this requirement are provided by subsection 28(3) of this Regulation or subsection 6(2) of the General Effluent Monitoring Regulation.**

Subsection (3) allows a mill to certify that a primary flow measuring device was designed and installed according to an accepted national or international code, in which case the device will be deemed to meet the ± 5% accuracy requirement and the mill is also relieved of the obligation to perform an initial calibration of the device. The certified report is to be submitted to the Director.

Subsection (4) applies on any operating day when the flow of a process effluent stream cannot be continuously measured. In this case, the mill may estimate the total volume of effluent discharged by that stream for that day.

> **The mill must use generally accepted engineering principles to estimate the total volume of effluent.**

Subsection (5) requires all mills to measure or estimate the flow of each cooling water effluent stream and waste disposal site effluent stream and to record the information.

> **If the mill chooses to estimate the flow, the mill must use generally accepted engineering principles to estimate the flow.**

Subsection (6) requires that the flow of each cooling water effluent stream should be measured or estimated within an accuracy of ± 20% of the actual flow.

Subsection (7) requires all mills to estimate the total volume of effluent discharged from each backwash effluent stream and storm water effluent stream, when samples are collected from those streams, and to record the duration of the discharge and the estimated volume.

> **The mill must use generally accepted engineering principles to estimate the volumes of effluent discharged.**

Subsection (8) requires all mills to measure or estimate the total volume of emergency overflow discharged for each event in which samples are collected, and to record the location, duration of the discharge and the estimated volume.

If the mill chooses to estimate the volume of emergency overflow, the mill must use generally accepted engineering principles to estimate the volume.

Subsection (9) exempts mills from the accuracy requirement in the General Effluent Monitoring Regulation to measure flows of waste disposal site effluent streams and storm water streams to within ± 20% of the actual flow.

Subsection (10) requires the mill to choose locations at which the flow of an effluent stream is measured or the volume discharged by an effluent stream is estimated, so that measurements or estimates representative of the flow at the sampling point for that stream will be produced.

To allow mills to use the "rational method" for the estimation of storm water volumes, subsection (11) exempts storm water volume estimates from the requirements of subsection (10).

REPORTING REQUIREMENTS - ALL CATEGORIES

All mills are required to report all monitoring data to the Ministry.

Electronic data reporting systems have been developed by the Ministry and must be used by the mills to report the data.

The requirements of subsections (1) through (29) of Section 29 are straightforward and require no further clarification. However, there are a few points that should be noted:-

At present, the ministry does not have a list of point discharges for each of the mills. To facilitate the identification of streams, paragraph 29 (2)(1) requires mills to code and name effluent streams, sampling points and flow measurement/estimation points.

Subsection (5) requires mills to identify types of effluent streams on the plans submitted in the Initial Report.

The mill should also include the mill identification code for each stream, sampling point and flow measurement or estimation point.

The codes which the mill reports should be the codes normally used by the mill when referencing the stream, the sampling point, the flow device or the flow measurement/estimation location.

COMMENCEMENT

Section 30 deals with the times at which various requirements of the Regulation come in to force.

Subsections (1) and (2) of are straightforward and require no further clarification.

Mills must submit an Initial Report to the Regional Director by the 1st day of November, 1989.

Effluent monitoring commences on the 1st day January, 1990.

REVOCATION

Section 31 states that the Regulation will be in force for a period of twelve months.

INTAKE WATER MONITORING

Although not covered in the Regulation, the industry expressed a concern that intake water quality should be considered in the development of Limits Regulations, particularly for some mills where it is known that high concentrations of certain parameters of concern are present in the intake water. The ministry does not agree with the use of net loadings but acknowledges that mills with a concern should be allowed to report intake water data along with the monitoring data.

Where a mill believes that its intake water may contain significant concentrations of one or more of the parameters being monitored under the Regulation, that mill will be allowed to report intake water monitoring data provided the data are collected under MISA quality control and quality assurance procedures.

Any mill wishing to report intake water data should identify this intent to the Director in the Initial Report together with proposed QA/QC monitoring information on the collection of the data and the reasons why the intake water data are considered important.

Sampling frequency requirements for intake water monitoring will be the same as those required for that compound or parameter in the Regulation.

RESIDUAL CHLORINE DETERMINATION IN TOXICITY TESTING OF COOLING WATERS

Concerns were expressed by Industry that many of its cooling water effluents might prove toxic to rainbow trout as the result of the presence of residual chlorine in concentrations above the toxicity threshold limit. The Industry argued that the Regulation should provide for the analysis of residual chlorine in cooling water samples prior to any toxicity testing. The Ministry was willing to accommodate this concern but has not been able to provide an analytical protocol for residual chlorine determination which could be defensible in a Regulation.

Recognizing the importance of this concern to the Industry, the Ministry is prepared to allow mills to report the residual chlorine content of cooling water samples used for toxicity testing purposes.

The mill should use a method for determining residual chlorine content which it believes to be reliable.

Any mill wishing to report residual chlorine data along with its toxicity test data should notify the Regional Director at the same time as the initial report is submitted and should inform the Director of the analytical test method that will be used.